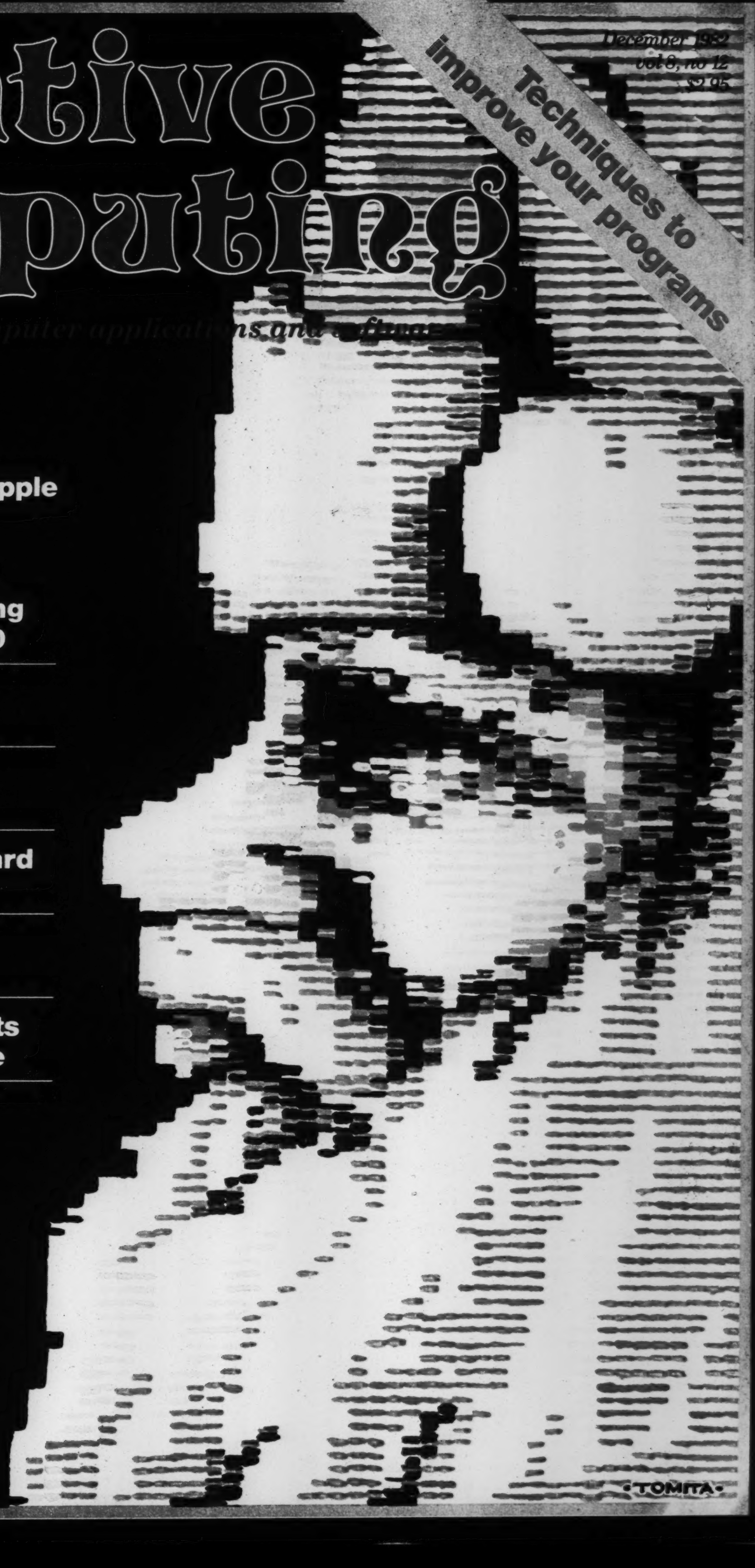
December 1982
vol 8, no 12
$2.95

creative computing

the #1 magazine of computer applications and software

Techniques to improve your programs



In-depth Evaluations:

- Tymshare Scanset
- Communitree
- 6 Processors for the Apple
- Colecovision
- Electric Duet
- Speech Synthesizers
- 18 Games for Gift Giving
- B & O Beosystem 8000

Tutorials on Ada and Pilot

Parallel Processing for Microcomputers

Build a Standard Keyboard for your Atari 400

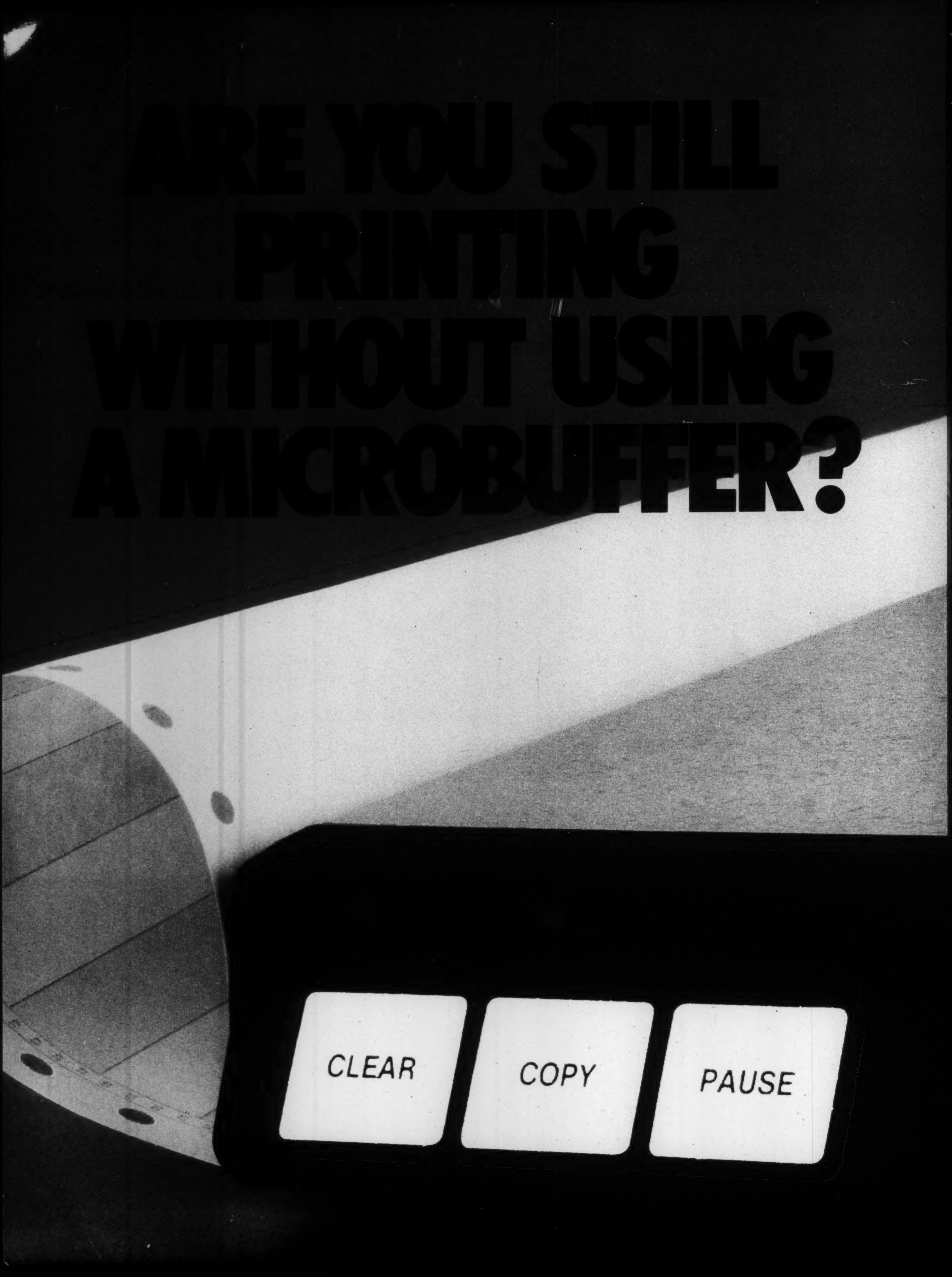
Complete Directory of VIC-20 Products

Special Section on Robots and Artificial Intelligence

Columns:

- Apple
- Atari
- IBM
- TRS-80
- Graphics
- Books
- New Products

0 14024 14044 12


ARE YOU STILL PRINTING WITHOUT USING A MICROBUFFER?
CLEAR
COPY
PAUSE

WHY?

USING YOUR COMPUTER TO DRIVE YOUR PRINTER IS A WASTE OF TIME.

While your printer is running, your computer is tied up. All you can do is twiddle your thumbs until the program is finished.

MICROBUFFER ALLOWS YOU TO PRINT AND PROCESS SIMULTANEOUSLY.

You just dump your printing data directly to Microbuffer, whoosh!, and continue processing.

Microbuffer accepts data as fast as your computer can send it. It first stores the data in its own memory buffer, then takes control of your printer.

It's that easy.

THERE IS A MICROBUFFER FOR ANY COMPUTER/PRINTER COMBINATION.

Microbuffers are available in Centronics-compatible parallel or RS-232C serial versions.

FOR APPLE II COMPUTERS, Microbuffer II features on-board firmware for text formatting and advanced graphics dump routines. Both serial and parallel versions have very low power consumption. Special functions include Basic listing formatter, self-test, buffer zap, and transparent and maintain modes. The 16K model is priced at $259 and the 32K, at $299.

FOR EPSON PRINTERS, Microbuffer is $159 in either an 8K serial or a 16K parallel version. The serial buffer supports both hardware handshaking and XON-XOFF software handshaking at baud rates up to 19,200. Both interfaces are compatible with Epson commands including Graftrax-80 and Graftrax-80+. Both are user-expandable to 32K.

ALL OTHER COMPUTER/PRINTER COMBINATIONS are served by the in-line, stand-alone Microbuffers. (Pictured here, twice actual size.)

Both serial and parallel versions are expandable up to 256K.

The serial stand-alone will support different input and output baud rates and handshake protocol. The 32K model starts at $299, $349 for 64K, and 64K add-ons (for up to a total of 256K) are just $179.

SIMPLE TO INSTALL.

Microbuffer II is slot-independent. It will fit directly inside the Apple II in any slot except zero.

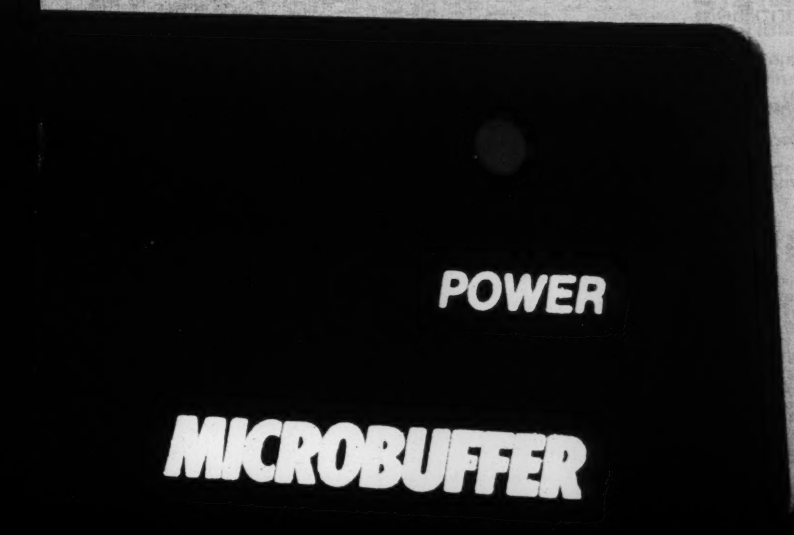
Microbuffer for your Epson mounts easily in the existing auxiliary slot directly inside the Epson printer.

The stand-alone Microbuffer is installed in-line between virtually any printer and any computer.

MICROBUFFER FROM PRACTICAL PERIPHERALS.

When you think of how much time Microbuffer will save, can you afford to *not* have one?

PRACTICAL PERIPHERALS, INC.™
31245 LA BAYA DRIVE
WESTLAKE VILLAGE, CA 91362
(213) 991-8200



See Us At
COMDEX™
Nov. 29-Dec. 2, 1982
Las Vegas Convention Center
Las Vegas, Nevada

CIRCLE 273 ON READER SERVICE CARD

As IBM would design it

The Personal Hard Disk™ from Corona™.
Only for the IBM Personal Computer.

Corona specialization makes the difference:

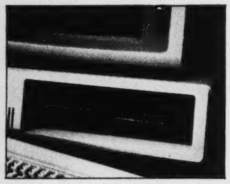
It fits right in—right inside the IBM Personal Computer, with no external power supply.

And it makes friends fast—with self-documenting, menu-driven, very "user-friendly" software.

It responds to your needs—for multiple operating systems on the same disk at the same time, in flexible partitions that grow as needed.

It backs you up—on floppies, using "selective" backup (by date, by volume, by category), so an additional backup device is not needed.

And it has reliability you can count on—combining exclusive use of Seagate drives with Corona's DataGuard™ and FailSafe.™



And the price?

$1995 for 5 MB,

$2495 for 10 MB

Experience the difference specialization makes.

Ask your dealer to show you the Corona Personal Hard Disk (or call us for dealership and quantity purchase information).

corona

The Third Generation Microcomputer Company

Corona Data Systems 31324 Via Colinas, Section 110, Westlake Village, CA 213-706-1505

CIRCLE 166 ON READER SERVICE CARD

in this issue...

evaluations & profiles

16 **Tymshare Scanset** .... *Anderson*
Terminal velocity

20 **Communitree** .... *Coffey*
The start of a new wave in human communication

30 **New Processors for The Apple** .... *Coffey*
Better performance and added features

48 **Colecovision** .... *Linzmayer*
New kid on the block

58 **Stocking Stuffers** .... *Anderson, Archibald*
18 games for gift giving *Linzmayer, McNamee*

100 **Bang & Olufsen Beosystem 8000** .... *Ahl*
A price-is-no-object hi-fi stereo system

114 **Electric Duet** .... *Ahl*
Music synthesis with software

137 **Talk is Getting Cheaper** .... *Anderson*
Three approaches to speech synthesis

148 **The Color Computer Speaks** .... *Norman*
Compuvoice from Radio Shack

articles

120 **Speech! Speech!** .... *McComb*
A close look at speech synthesis

156 **Automatalk** .... *Prince*
A progress report on robotics

167 **Inventing The Future** .... *Williams*
An historian's view

180 **Computers & Creativity** .... *Ten Dyke*
Can computers create?

200 **Experience, Experiments and Intelligence** .... *Berry*
A guest editorial

204 **Burn-Out To Born Again** .... *Urbanowicz*
Atari makes a convert

214 **Logo Ideas** .... *Lawler*
Single-key interfaces

216 **The Countess and The Computer** .... *Gilpin*
Part II

233 **Rediscovering Level II** .... *Spahitz*
Programming techniques for TRS-80 Model I

243 **Pilot Tutorial** .... *Smith*
Part II

254 **Improving Readability** .... *Lundeen*
Make your programs easier to use

256 **Cerf vs. Mimura** .... *Cerf*
A championship game of Othello

fiction & foolishness

179 **Die Wahrheit** .... *Jaeger*

213 **Computer Carols** .... *Anderson*

264 **Picturing Infinity** .... *Payack*

applications & software

268 **Parallel Processing** .... *Parent*

284 **Searching Techniques** .... *Mitchell*
How to find it

298 **The Monkey and The Hunter** .... *Rogowski*
A computer solution to a classic problem

312 **Creating A Hole in Applesoft Basic** .... *Parrott*

320 **Keeping Track of Variable Names** .... *McMillan*
An Applesoft utility

322 **Output Au Naturel** .... *Lowenstein*
Making text "look right"

326 **A Scrolling Routine for CBM/PET** .... *Bruey*
An easy way to examine output listings

328 **Pocket Computer Fun** .... *Rollins*
A maze program that fits in your pocket

330 **Twonky Revisited** .... *Hertel*
New version of an old favorite for TRS-80

336 **Checkers** .... *White*
Programming a strategy game

344 **Standard Keyboard For The Atari 400** .... *Noskowicz*
Build it yourself

346 **Love Potency Meter** .... *Ahl*
Build an analog to digital interface

departments

6 **Input/Output** .... *Readers*

8 **Notices** .... *Fee*

10 **Dateline: Tomorrow** .... *Ahl*

334 **Short Programs** .... *Humble & Disque*
For TRS-80 and Atari

350 **New Products** .... *Anderson & Coffey*

360 **Software Legal Forum** .... *Novick*
Insuring your computer

364 **Apple Cart** .... *Carpenter*

370 **Outpost: Atari** .... *Anderson*

378 **The Graph Paper** .... *Lubar*

384 **IBM Images** .... *Fastie*

396 **Personal Electronic Transactions** .... *Yob*
Directory of products for the VIC

408 **TRS-80 Strings** .... *Gray*

416 **Book Reviews** .... *Gray*

430 **Index To Advertisers** ....

December, 1982
Volume 8, Number 12

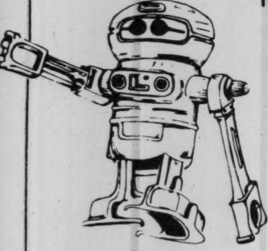
Creative Computing (ISSN 0 097-8140) is published monthly by Ahl Computing, Inc., a subsidiary of Ziff-Davis Publishing Company. David Ahl, President; Elizabeth B. Staples, Vice President; Selwyn Taubman, Treasurer; Bertram A. Abrams, Secretary. P.O. Box 789-M Morristown, N.J. 07960. Second Class postage paid at New York, NY 10001 and at additional mailing offices.

Copyright ©1982 by Ahl Computing, Inc. All rights reserved.

Editorial offices located at 39 East Hanover Ave., Morris Plains, NJ 07950. Phone (201) 540-0445.
Domestic Subscriptions: 12 issues $24.97; 24 issues $43.97; 36 issues $57.97.
POSTMASTER: send address changes to Creative Computing, P.O. Box 5214, Boulder, CO 80321. Call 800-631-8112 toll-free (in New Jersey call 201-540-0445) to order a subscription.

staff

Founder/Editor-in-Chief	**David H. Ahl**
Editor	**Elizabeth B. Staples**
Managing Editor	**Peter Fee**
Technical Editor	**Michael Coffey**
Associate Editor	**John Anderson**
Editor-At-Large	**Ted Nelson**
Contributing Editors	**Dale Archibald** **Charles Carpenter** **Thomas W. Dwyer** **Will Fastie** **Stephen B. Gray** **Glenn Hart** **Stephen Kimmel** **Harold Novick** **Peter Payack** **David Small** **Alvin Toffler** **Gregory Yob** **Karl Zinn**



Editorial Assistant	**Andrew Brill**
Art Director	**Susan Gendzwil**
Assistant Art Director	**Chris DeMilia**
Artists	**Diana Negri Rudio** **Candace Figueroa** **Eugene Bicknell**
Production Coordinator	**Christina L. Erickson**
Typesetters	**Karen Brown** **Renea Cole**
Advertising Director	**Jeff Weiner**
Creative Computing Press	**Laura Conboy** **Claudette Moore**
Software Development	**Eric F. Wolcott** **Owen Linzmayer** **Neil Radick** **Chris Vogeli**
Software Production	**Bill Rogalsky** **Nick Ninni** **Mark Levitt**
Operations Manager	**William L. Baumann**
Comptroller	**Patricia Kennelly**
Accounting	**Jennifer H. Shaler**
Bookkeeping	**Ethel Fisher**
Retail Marketing	**Jennifer Burr** **Laura Gibbons**
Fulfillment	**Frances Miskovich** **Rosemary Bender** **Linda Blank** **Pat Champion** **Susan DeMark** **Moira Fenton** **Elsie Graff** **Gail Harris** **Linda McCatharn** **Bridget Maher** **Joanne Sapio** **Carol Vita** **Barbara Werry** **Jim Zecchin**
Shipping & Receiving	**Ronald Antonaccio** **Mark Archambault** **Bill Thomas** **Scott McLeod** **Mike Gribbon**

advertising sales

Advertising Director
Jeff Weiner
Creative Computing
Ziff-Davis Publishing Company
One Park Avenue
New York, NY 10016
(212) 725-7957

Advertising Coordinator
Ruth Darling
Creative Computing
Ziff-Davis Publishing Company
One Park Ave.
New York, NY 10016
(212) 725-3446

Northern California, Northwest
Jules E. Thompson, Inc.
1290 Howard Ave., Suite 303
Burlingame, CA 94010
(415) 348-8222
From Colorado (303) 595-9299

Southern California, Southwest
Jules E. Thompson, Inc.
2560 Via Tejon
Palos Verdes Estates, CA 90274
(213) 378-8361

New England
CEL Associates, Inc.
27 Adams Street
Braintree, MA 02184
(617) 848-9306

Midwest
The Pattis Group
4761 W. Touhy Ave.
Lincolnwood, IL 60646
(312) 679-1100

Mid-Atlantic
Larry Levine
Ziff-Davis Publishing Company
One Park Ave.
New York, NY 10016
(212) 725-7668

Southeast
Browning Publications
P.O. Box 81306
Atlanta, GA 30366
(404) 455-3430

Canada
The Pattis Group
1623 Yonge St.
Toronto, Ontario M4T 241
(416) 482-6288

microform

Creative Computing is available on permanent record microfilm. For complete information contact University Microfilms International, Dept. F.A. 300 North Zeeb Road, Ann Arbor, MI 48106, or 18 Bedford Road, London WC1R 4EJ. England, and Micro Photo Division of Bell & Howell Company, Old Mansfield Road, Wooster, OH 44691.

where to send it

All **editorial material**, including article submissions, press releases, and products for evaluation should be sent to:

Creative Computing
39 E. Hanover Ave.
Morris Plains, NJ 07950

Correspondence regarding other Creative Computing products and publications should also be sent to the Morris Plains address.

Correspondence related to **advertising**, including ad copy, questions on billing, and requests for rates, should be sent to:

Advertising Department
Creative Computing
Ziff-Davis Publishing Co.
One Park Ave.
New York, NY 10016

Correspondence regarding **subscriptions**, including orders, changes of address, and problems should be sent to:

Creative Computing
P.O. Box 5214
Boulder, CO 80321

Your help in choosing the correct address for your correspondence is appreciated. An incorrectly addressed letter or package can take as long as several weeks to reach its proper destination.

subscriptions

All subscriptions orders and other correspondence related to subscriptions should be addressed to:

Creative Computing
P.O. Box 5214
Boulder, Colorado 80321.

Foreign subscriptions must be accompanied by payment in U.S. currency.

Subscription prices:

U.S.		**Canada**		**Foreign**	
1 year	$24.97	1 year	29.97	1 year	34.97
2 years	43.97	2 years	53.97	2 years	63.97
3 years	57.97	3 years	72.97	3 years	87.97

Airmail delivery on foreign subscriptions is available for a one-year period only at **$75.00** additional for mail to Asia and Australia, and **$50.00** additional for all other foreign.

Subscribers in the United Kingdom may send payment in sterling to:

Hazel Gordon
27 Andrew Close
Stoke Golding
Nuneaton, CV13 6EL

Please allow at least eight weeks for change of address. Include old address as well as new—enclosing if possible an address label from a recent issue.

attention authors

Creative Computing will not be responsible for the return of unsolicited manuscripts, cassettes, floppy disks, program listings, etc. not submitted with a self-addressed, stamped envelope.

maxell
THE
GOLD
STANDARD

In an age when new standards are constantly emerging, one disk consistently meets or exceeds them all.

Maxell. The Gold Standard.

Not all disks are created equal. Some are better than others. To find out what's best for you, look for Maxell disks. They now carry the Gold Standard symbol of quality. It's your assurance Maxell disks meet or exceed every definition of quality. No matter who establishes it. We've earned this universal superiority by never relaxing our uniquely demanding quality control. Every aspect of manufacturing is checked, then checked again.

Your benefits are many. Take the perpetual problem of drop-outs. A drop-out is a tiny defect that wastes time and degrades computer accuracy and performance. Now that you understand what a drop-out is, forget it. Maxell disks don't have any. Each disk comes to you certified drop-out free at the time of manufacture. You can depend on this quality protecting your valuable programs and programming time, indefinitely. We've run disks over ten million passes under conditions designed to find weak points and wear. We couldn't. And you won't.

There is a Maxell disk for the floppy system you use, or plan to use. Check your computer's instructions. Or write for our complete, highly informative brochure.

When you set the Gold Standard as your level of quality, you'll benefit from improved disk performance, immediately. Bank on it.

maxell
FD1
maxell
FH2
maxell
MD1

maxell®

Maxell Computer Products Division, 60 Oxford Drive, Moonachie, N.J. 07074, 201-440-8020

CIRCLE 198 ON READER SERVICE CARD

utput...input/output...inpu

Eliminating Bad Vibes

Dear Editor:

I have recently purchased a System Saver fan by Kensington Software. Although the fan works as advertised, I have made two improvements that your readers may be interested in.

First I covered the vent slots on the right side of my Apple with a section of air conditioning filter. This prevents dust from being drawn across the inside of the computer. The filter was attached with duct tape to the outside of the computer.

The second improvement was to place 1/8" thick foam rubber between the part of the fan case and the computer that come in contact with each other. This minimizes vibration.

Robert Gershowitz
76-51 169 Street
Flushing, NY 11366

Turtle Bottleneck

Dear Editor:

The Applesoft Turtlegraphics Interpreter featured in the July 1982 issue is an excellent program and a valuable addition to my library. However, I did have one slight problem with it.

When I attempted to draw a line straight down using the MOVE command, (by setting the turtle's angle to 180) the line never turned out quite straight. A couple dots at the end would always be plotted one column to the left.

After experimenting with the program for a while, I found the problem to be the way in which the MOVE subroutine computes the amount of X-axis movement. As originally written, the variable DX would sometimes be ever so slightly too small, causing the above mentioned problem. This can be corrected by changing line 3010 to read:

3010 DX = INT (DIST * SIN (TA) + .5): DY = INT (DIST * COS (TA) + .5)

I would like to thank *Creative Computing* for continually pubishing quality Apple programs. I am also very thankful for David Lubar's new column, "The Graph Paper." I am already looking forward to the next issue.

Matthew Storch
Box 133, RD 1
Avonmore, PA 15618

Acceleration of a Sort

Dear Editor:

I found Mark Pelczarski's "A Modular Data Base for the Apple" (September 1982 issue, page 146) to be extremely useful. I have adapted it to my personal filing needs—something impossible to do with commercial "locked" programs.

However, one very slight modification in the program makes such a dramatic improvement that I really must write about it. As written, the sort routine is much slower than it should be, requiring 14 seconds to alphabetize 20 strings, 90 seconds for 50, and 24 minutes for 200 items. A simple Applesoft procedure shortens these times by almost 90%, to 2, 12, and 190 seconds respectively.

First, remove the print statement in the middle of the sort (line 7122). This shortens the time by 20%. Then modify lines 7070 to 7180 so that two different routines are involved, one for ascending and the other (if desired) for descending order. The removal of the branching in line 7125 will shorten the sort time by a factor of six.

With these modifications, files with up to several hundred records can be handled by the Pelczarski program. The practical limit depends not only on sort time but also on the disk capacity and the time required to search for records on the disk, as with all disk-based filing systems.

Peter P. Berlow
2062 Vendome Ave.
Montreal, Quebec H4A 3M5
Canada

Justifiable Adjustment

Dear Editor:

I just finished typing in Bruno Wolff's "Pseudo Word Processor" from your June issue. After finding that the program works quite well, I decided to write a subroutine to give the program right margin justification.

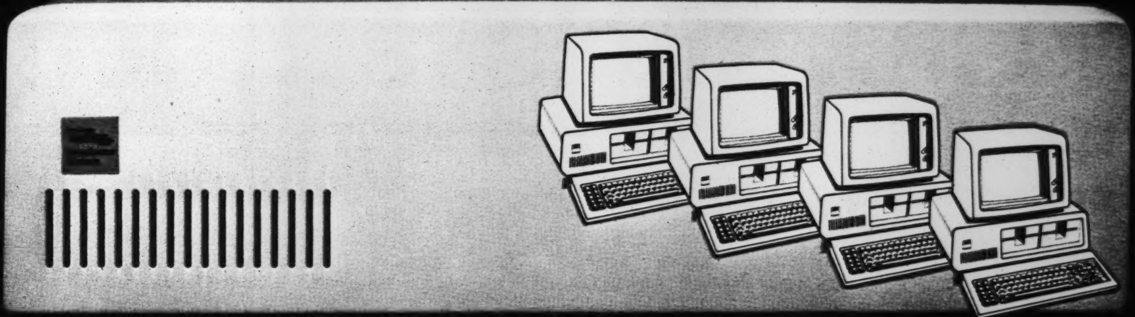
Just add the lines below to the program and everything should come out just right.

```
751 If Len (A$(J)) < 71 and Len (A$(J)) > 60
    Then Gosub 5000

5000 R = 7

5010 If Len (A$(J)) = 71 Then Return

5020 If Mid$ (A$(J),R,1) < > Chr$ (32) Then 5130

5100 C$ = Left$ (A$(J),R): L = Len (A$(J))

5110 B$ = " " + Right$ (A$(J),L-R)

5120 R = R + 1: A$(J) = C$ + B$

5130 R = R + 1: Goto 5010
```

Duane Hill
1074 Valley Park
Marion, IA 52302

SHARED WINCHESTER DISK!

The NEXT STEP from TECMAR



Now, Up to FOUR IBM Personal Computers Can Share the Same PC-MATE Winchester Disk System.

Give each Personal Computer a complete logical device for total READ/WRITE freedom, or they can all share a device for READ Only applications.

All PC-MATE WINCHESTER/5™ and WINCHESTER/10™ disk systems now feature the new ultra fast GT DMA disk controller. This new controller not only provides superior performance, it can serve as the base unit for the Shared Disk Facility.

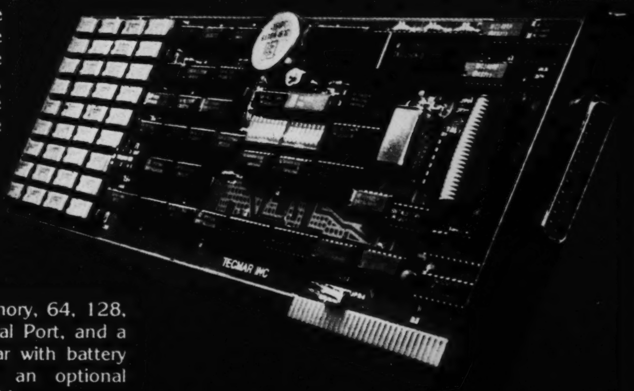
The WINCHESTER/5™ is $2995 and WINCHESTER/10™ is only $3995. Each additional PC to share the disk needs only a PC-SHARE™ adapter at just $495.

An Expansion Chassis, Five or Ten Megabyte Winchester Disk, Superior performance and Disk Sharing are just a few reasons why the PC-MATE™ Winchester Disk System should be your next step.

ALLinONE™ EXPANSION FOR THE IBM PERSONAL COMPUTER.

Memory, Serial, Parallel, Clock/Calendar with Battery and more!!!

PC-Mate™ by TECMAR, the first and only complete line of expansion options for the IBM Personal Computer, now brings you the ultimate expansion product, the ALLinONE™ Board.



ALLinONE™ gives you memory, 64, 128, 192 or 256K bytes, a Serial Port, and a Parallel Port, Clock/Calendar with battery backup and circuitry for an optional Programmable Array Logic chip.

Ready to use, ALLinONE™ comes complete with the DB25 connectors on Serial and Parallel Ports, Software to set system Time and Date, and the popular RAMSPOOLER™ utility to allow printing as a background task.

Put all of these features together with these prices, and you really have it ALLinONE™

$565. - 64K Bytes $735. - 128K Bytes $875. - 192K Bytes $975. - 256K Bytes

Tecmar is currently shipping over thirty different expansion products including Memory, Winchester Disks, Communications Interfaces, Laboratory/Scientific/Industrial products and more!

For IBM Personal Computer Expansion, The Next Step . . . . TECMAR.

Call or write for product specifications and the name of your nearest participating Computerland and other fine PC-Mate Retailer internationally.

Tecmar Inc.

PERSONAL COMPUTER PRODUCTS DIVISION
23600 Mercantile Road, Cleveland, Ohio 44122
Telephone: (216) 464-7410 Telex: 241735

CIRCLE 352 ON READER SERVICE CARD

tices...notices...notic

PCW Chess Tournament

The Third Personal Computer World Microcomputer Chess Tournament held at Barbican Centre in London on September 9-12, 1982 was won by a private entry. Michael Johnson and David Johnson (6 out of 7) proved too strong for the rest of the field. Their program, called Advance 2.4, ran on a homemade bitslice machine. They were awarded the trophy for first place as well as the best amateur program trophy. This was accompanied by a cash prize of £150. Second prize of £50 was won by Mark Bryant with a program called White Knight Mark Ten (3 1/2 out of 7).

The tournament was a seven round Swiss event. Fourteen competitors entered compared to twelve last year. Best commercial entry was David Levy's La Regence, a sensory board machine designed by Intelligent Software (5 out of 7).

Four commercial entries competed. The others were Bogel (4 out of 7) developed by the Hamburg company Omikron; Comchess entered by the Dublin company Waltham Electronics (2 1/2 out of 7); and Spectrum Chess developed by Arctic Computers (1 1/2 out of 7).

The criterion for classifying a program as commercial was that it was either on sale at the time of entry or would be available in the shops by December 31, 1982.

Corrections

The proper address to receive more information on the *Savvy* information handling system (October 1982, page 182) is: Savvy Marketing International, 100 South Ellsworth St., 9th Floor, San Mateo, CA 94401. (415) 340-0335.

The price and address for the Dotsy Printer Center (October 1982, page 168) are incorrect. The price is $1495, and the address is: Metaframe Computer Corporation, Riverside St., Nashua, NH 03062. (603) 880-3005.

Version 4.0

The Ultimate **APPLE**® Utility Program

COPY II PLUS

Now you can back up your protected software. Copy II Plus is the most sophisticated bit copy program available. It handles synchronized tracks, half tracks, nibble counting, bit insertion and other protection schemes. It also includes a comprehensive discussion of disk format and protection techniques, and instructions on how to back-up dozens of popular programs. A disk system and speed check assure your drives are running in top condition and a nibble editor will allow you to repair damaged diskettes, analyze protection schemes, etc.

The last DOS utility disk you will need. Fully menu driven, the Copy II Plus utilities include a catalog display with binary file addresses and lengths, a disk usage map, and the ability to verify and compare files for differences. It can copy, lock, unlock and delete files and DOS can be copied, or removed from a disk to free up space. You can change the greeting program on a DOS disk, or initialize a disk from scratch. The Copy II Plus sector editor will allow you to view and modify data in either hex or ASCII format.

For your convenience, Copy II Plus is not copy protected for backup.
Available at fine computer and software stores or direct from:

CENTRAL POINT
Software, Inc.

P.O. Box 19730-203
Portland, OR 97219
(503) 244-5782

$39.95

Attention current Copy II Plus owners: Return your original disk with $19.95 for an update to Version 4.0.

CIRCLE 133 ON READER SERVICE CARD

THE LEADING EDGE IN PRINTERS

ONE GREAT LINE. ONE GREAT WARRANTY.

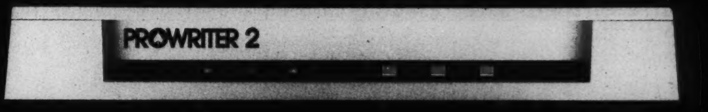
Finally, there's one full family of printers that covers every business or word processing application—all from C. Itoh, a company known for packing more product into less price; and all distributed exclusively by Leading Edge, a company known for searching out and providing that very thing. Which means that one call to one source can get you any printer, any time you need it, for any purpose. All backed by a full years' warranty from Leading Edge. (Try *that* on any other line of printers.)

THE PRO'S.

The Prowriters: business printers—and more. The "more" is a dot-matrix process with more dots. It gives you denser, correspondence quality copy (as opposed to business quality copy, which looks like a bad job of spray-painting).

Prowriter: 120 cps. 80 columns dot matrix compressable to 136. 10" carriage. Parallel or serial interface.

Prowriter 2: Same as Prowriter, except 15" carriage allows full 136 columns in normal print mode. Parallel or serial interface.



THE STAR.

The Starwriter F-10. In short (or more precisely, in a sleek 6" high, 30-pound unit), it gives you more of just about everything—except bulk and noise—than any other printer in its price range. It's a 40 cps letter-quality daisy-wheel with a bunch of built-in functions to simplify and speed up word processing. It plugs into almost any micro on the market, serial or parallel.

STARWRITER F-10

THE MASTER.

The Printmaster F-10. Does all the same good stuff as the Starwriter except, at 55 cps, the Master does it faster.

PRINTMASTER F-10

Distributed Exclusively by Leading Edge Products, Inc., 225 Turnpike Street, Canton, Massachusetts 02021
Call: toll-free 1-800-343-6833; or in Massachusetts call collect (617) 828-8150. Telex 951-624.

CIRCLE 199 ON READER SERVICE CARD

ow...dateline:tomorrow...da

David H. Ahl

VIDEO GAMES FOUND HARMFUL BY BAHRAIN DOCTOR

I recently travelled around the world with stops in Tasmania (9th Australian Computer Conference), Singapore, Bahrain and London (Personal Computer World Show).

Bahrain is an island in the Persian Gulf off the coast of Saudi Arabia. With the unrest in Lebanon, Bahrain has become the banking center of the Middle East. However, in many ways it clings to ancient Arab traditions with civilization on the island dating back to 2700 B.C.

The following is an excerpt of an article which appeared in a Bahrain newspaper September 3, 1982.

> Dr. Andrew McQuitty, a Briton who now works in Bahrain, has warned of the danger of epileptic fits caused by certain flashing sequences--even among people with little or no history of epilepsy.
>
> He cited the example--quoted recently in the British Medical Journal--of a 17-year old girl who suffered a fit after a multi-colored flashing sequence in a video game called "Dark Warrior."
>
> Her father was a video games maintenance engineer and she usually played machines of different types for up to two hours a day--but only this particular sequence precipitated epilepsy.
>
> The girl had no previous history of fits or convulsions nor did her family.
>
> Since the article was published, a number of other cases have been reported.
>
> A 17-year old girl who had previously had one fit--not related to video games--suffered an attack while playing a game called "Dune Buggy."
>
> It is well-known in medical circles that flashing lights, for example strobes in a disco or even a flickering TV, can trigger epilepsy in people who are susceptible," said Dr. McQuitty, who is investigating the situation in Bahrain.
>
> "The home video industry appears to be another cause--possibly in people who would not normally be prone to any form of epilepsy," he says.

MEANWHILE, SINGAPORE ACTS TO CLOSE ALL VIDEO GAME ARCADES

The Singapore government announced on September 2, 1982 that all amusement centers with electronic and video games will be closed within the next twelve months.

The Ministry of Culture issued a statement saying the 64 amusement centers throughout the country "have undesirable influences on school children."

SINGAPORE SCHOOLS WELCOME PERSONAL COMPUTERS

A feature article in The Straits Times (Singapore) described how personal computers, mainly Apples and TRS-80's are increasingly being used in classrooms throughout Singapore.

While the American School has been using computers for several years, it is only recently that they have begun to creep into regular Singapore schools. Applications are much the same as they are in the United States--problem solving and drill and practice in mathematics, simulations in science and social studies, and occasional applications in other subject areas.

Not only are schools using computers, but computer literacy is a nationwide imperative. While walking around Jurong, an industrial center, we saw huge banners everywhere urging workers to become computer literate. Free courses were offered at the Worker's Center, a kind of union.

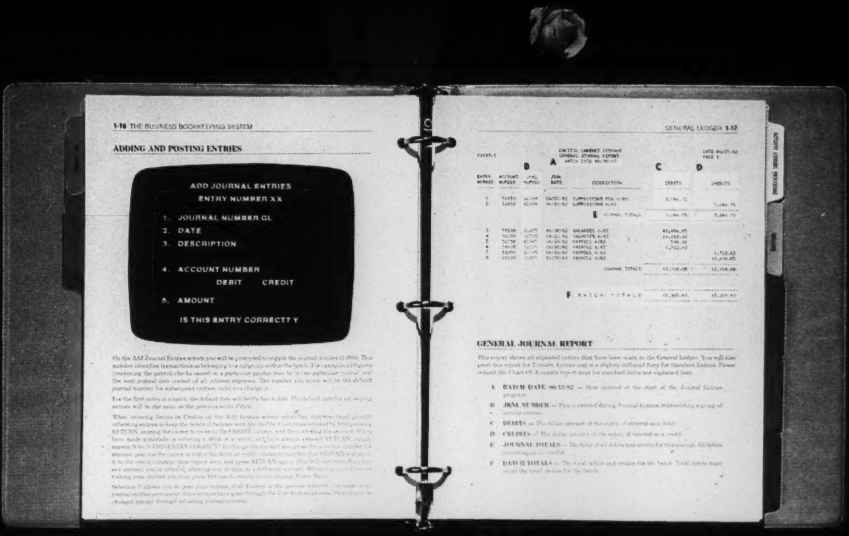
PINEAPPLES, ORANGES AND OTHER CHINESE COPIES

I spoke with several groups of personal computer enthusiasts in Singapore. At least three people allowed that they owned Apple look-alikes that cost considerably less than the genuine article. Two of these copies came from Hong Kong and one, apparently, from Taipei. (Apple has manufacturing facilities in Singapore but not in Hong Kong or Taiwan).

For the most part these Chinese copies look exactly like Apples (the shade of the case, keyboard markings and logos are slightly different) although some use entirely different housings and boards. Naturally, there is no warranty, and service is difficult to obtain.

On its part, Apple is trying to thwart these pirates. So far, Apple has won injunctions against five manufacturers in Hong Kong, one in Taipei, and one in New Zealand.

Apple has also enlisted the aid of U.S. Customs which is seizing fake Apple computers at major U.S. points of entry. This, of course, has no effect on sales in other major Apple markets such as Australia, Singapore, England, and Canada.



1-10 THE BUSINESS BOOKKEEPING SYSTEM

ADDING AND POSTING ENTRIES

```
ADD JOURNAL ENTRIES
ENTRY NUMBER XX

1.  JOURNAL NUMBER GL
2.  DATE
3.  DESCRIPTION

4.  ACCOUNT NUMBER
          DEBIT      CREDIT

5.  AMOUNT

    IS THIS ENTRY CORRECT? Y
```

GENERAL LEDGER 1-17

GENERAL JOURNAL REPORT

A Cheap Trick.

The Dakin 5 Business Bookkeeping System.™ We do more, faster—yet cost less than any comparable program!

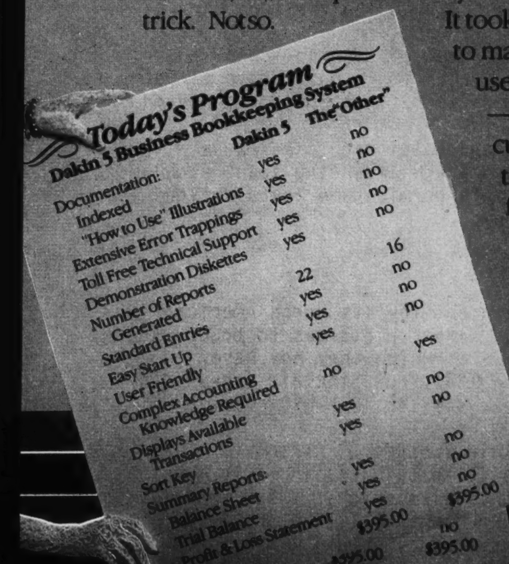
That, our competitors may feel, was a cheap trick. Notso. It took no magic at all to make us shine. We used our heads—and gave our customers what they asked for. A Quick, easy-to-use system that encompasses general ledger, vendor activity, customer activity and employee activity. Aging with receivables. Visual documentation. Toll-free hot line for technical support. And a reasonable price.

No matter what your accounting needs are—from personal to business—the Dakin 5 Business Bookkeeping System™ solves the problems. (So does our Budget Planner,™ Depreciation Planner,™ Analyzer,™ and Programming Aids.™ But more on that and other versatile new tricks later.)

Dakin 5. We give it all to you. Faster, easier and for less. Honestly.

Just ask your local computer retailer.

Dakin 5. Answers that put an end to the disappearing dollar.



Today's Program

Dakin 5 Business Bookkeeping System

	Dakin 5	The "Other"
Documentation:		
Indexed	yes	no
"How to Use" Illustrations	yes	no
Extensive Error Trappings	yes	no
Toll Free Technical Support	yes	no
Demonstration Diskettes	yes	no
Number of Reports Generated	22	16
Standard Entries	yes	no
Easy Start Up	yes	no
User Friendly	yes	no
Complex Accounting Knowledge Required	no	yes
Displays Available Transactions	yes	no
Sort Key	yes	no
Summary Reports:		
Balance Sheet	yes	no
Trial Balance	yes	no
Profit & Loss Statement	yes	no
Price	$395.00 $395.00	$395.00 no $395.00

☐ Please send information on the Business Bookkeeping System
☐ Also enclose information on other Dakin 5 business software.

Name ________________________________

Address ________________________________

City __________ State __________ Zip __________

5 ™

DAKIN 5 CORPORATION

7000 Broadway, Suite 304, Denver, CO 80221 (303) 426-6090.

Toll free Hot Line: 800-325-0463

CIRCLE 169 ON READER SERVICE CARD

ATARI, TOO, HIT BY CHINESE COPIES OF PAC MAN

Atari has taken legal action against two Hong Kong companies who were making Pac Man home video games.

Video Technology Ltd. and Soundic Electronics Ltd. received court injunctions to restrain the companies from manufacturing and marketing Pac Man games. Atari has exclusive rights to manufacture and sell the Pac Man home video game under a license from Namco Enterprises of Japan.

PRICING WAR: ROUND 3

Video game makers are beginning to feel the heat as the price of low-end personal computers comes close to that of video games. The $100 rebate on the TI 99/4A effective September 1 brings the effective price to $199. This is also the approximate street price of the Commodore VIC-20 after the new $25 to $40 wholesale price reduction.

Atari's reduction takes the form of six $10 coupons applicable to software packages, a clever way to get people buying the blades after the razor. And, of course, the Timex 1000/Sinclair ZX81 started out low--$99.

As a result of these declines, many video game makers are rethinking their prices. Rumor has it that the Atari VCS will drop to under $100 after Christmas; street price in the New York area now is $129. Mattel will probably lower the price of Intellivision to $149, down from $200 now. Magnavox, not waiting until January, has announced a $15 rebate on its Odyssey video game, although it's not much considering the $199 suggested list price.

COMPUTERS FOR ALL STUDENTS AT STEVENS, CARNEGIE-MELLON

Carnegie-Mellon University has one of the foremost programs in computer science today. Not only that, but most students at CMU in all disciplines except drama are expected to be computer literate and to use computers in conjunction with their courses.

To reinforce the view that computers are tools for use in all areas, every entering freshman at CMU will receive a powerful small computer. At the end of four years, the computer will belong to the student, its cost being built into tuition.

The computer the students will receive is no Apple. Expected to have nearly the power of a small DEC VAX system, the computer will also be able to tie into the university network of large mainframes. Just imagine 7000 students in one network playing spacewar. Target date for the start of the program is the 1983-84 school year.

However, Stevens Institute of Technology in Hoboken, NJ isn't waiting. Starting in 1982, every entering student in certain disciplines must purchase an Atari computer for about $750, a fraction of the $50,000 cost to attend Stevens for four years. Says Dean Edward Friedman, the objective is to have "the students begin to think of the computer as a permanent part of their intellectual support systems."

WHILE SOME TOWNS DEBATE VIDEO GAMES, OTHERS REAP THE PROFIT

Kent, Washington, a town of 23,000 south of Seattle added about $20,000 to the town coffers from nine video games it placed in a local recreation center.

Dallas also operates games in six recreation centers but turns them off during school hours. To discourage game addiction, players may not use a game for more than four consecutive plays.

And Fairfax County, Virginia has been operating games for four years. Projected revenue in 1983 is $110,000.

On the other hand, many cities such as Boston, San Francisco and Baltimore have rejected the idea of video games on public property. And even more towns have tough licensing laws, such as Morristown, NJ, for example that do not allow game arcades and only permit game installations in restaurants or stores where they are secondary to the main business.

SINCLAIR ZX81 OUT, TIMEX 1000 IN, SPECTRUM COMING

In accordance with their agreement with Timex, Sinclair is dismantling its North American mail order operations and granting exclusive marketing rights to Timex. This was to occur when monthly sales of the Timex 1000 (Sinclair ZX81) reached 75,000 units which they now have.

This also means that American Express will no longer sell the ZX81 from Sinclair (they sold 70,000 + units in four months) although they may well negotiate a similar deal with Timex, Commodore, Atari or TI. Am Ex admits to be "seriously talking with six firms."

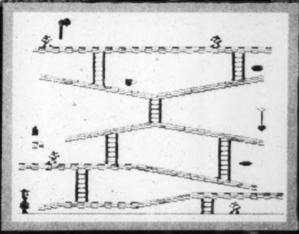
An interesting conflict is brewing with respect to the Sinclair spectrum. Already a successful seller in Britain, Sinclair expects to start selling it in the U.S. in early 1983. However Timex claims its exclusive North American marketing rights also cover the Spectrum. Sinclair doesn't agree. Furthermore, Sinclair is talking to Am Ex about marketing the Spectrum. The 16K Spectrum is selling in the U.K. for a dollar equivalent price of about $200; a 48K unit goes for $280.

Stake a Claim on the most exciting New Game for your Atari Home Computer.

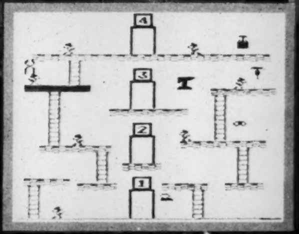
MINER 2049er
STARRING BOUNTY BOB
XXX
BY BILL HOGUE
ROSS

- From the programming team that brought you "Robot Attack", "Defense Command" and many other great Arcade games for your TRS-80™
- 100% machine language
- 16K ROM Cartridge, the largest available anywhere!
- Written specifically for the Atari® — not a converted Apple® game.
- Ten different rounds
- Difficulty adjustment
- High score table
- Demo mode
- Spectacular sound and graphics
- Runs on any 400/800 with at least 16K memory
- Only $49.95

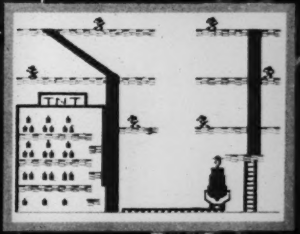
Here are just three of ten rounds in the game:



Round 1: The Mine Shaft.
Sharpen your miner's skill [illegible]



Round 3: The Transporters.



Round 10: The Cannon.
Shoot yourself [illegible]

BIG FIVE SOFTWARE

P.O. Box 9078-185 · Van Nuys, CA 91409 · (213) 782-6861

CIRCLE 125 ON READER SERVICE CARD

To order, see your local dealer. [illegible] 2049er, then send a check or money order [illegible] $2.00 for shipping and handling for immediate shipment! (California residents add [illegible] sales tax.) [illegible] are trademarks of [illegible]

Spinnaker presents
Delta Drawing.™

DELTA DRAWING™
SPINNAKER™
We make learning fun.
Learn computer programming concepts while creating your own colorful pictures.
Ages 4-14

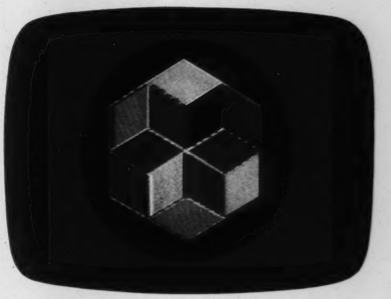
An introduction to the modern art of programming using the ancient art of drawing.

© Spinnaker Software Corp., 1982

Kids love to draw.

And with Delta Drawing, your children can have fun creating their own colorful drawings, and at the same time, learn about computer programming.

Delta Drawing is much more than just a fun game. It's an educational tool that helps children develop their creativity, learn to write computer programs and build an understanding of procedural thinking.



Easier to use than LOGO.

Delta Drawing makes it easy for children to use the computer—even if they've never used a computer before.

In fact, it's easier to use than LOGO turtle graphics. And Delta Drawing costs less than half as much as LOGO.

With Delta Drawing, your child controls the Delta cursor, and the Delta cursor controls all the action. So kids can learn at their own pace while they're having fun.

How your children will learn programming.

With Delta Drawing, your child first creates a picture using simple, single-key commands, for example: "D" for draw, "L" for left, "E" for erase.

As the picture is being drawn, the computer keeps track of every keystroke and records it as a program.

Then, by touching the "T" key for "text mode," the child can see the program that was written. As children progress, they can begin to write their programs in the text mode and switch to the graphics mode to see their pictures. They can even switch back and forth between graphics and text modes.

Delta Drawing will make your child comfortable with the computer and helps develop procedural thinking—the kind of step-by-step approach needed to write programs and solve problems with computers.

Get Delta Drawing today.

Delta Drawing can be played on Apple® and IBM® computers.

It comes complete with easy-to-follow fast-start cards. And for more advanced users, a completely detailed instruction manual.

You can save your child's drawings on a blank disk and even print them, if you have a printer with graphics capabilities.

So look for Delta Drawing at your local software store. Or write to Spinnaker, 215 First Street, Cambridge, MA 02142.

You'll find that when we combined learning and fun, we created a work of art.

SPINNAKER™

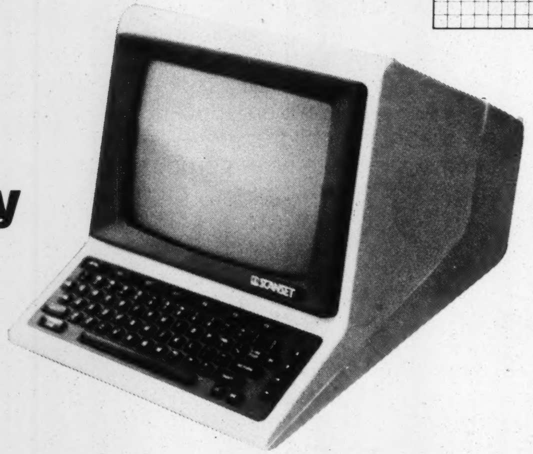
We make learning fun.

Apple, and IBM are registered trademarks of Apple Computer, Inc., and International Business Machines Corp. respectively.

CIRCLE 331 ON READER SERVICE CARD

Tymshare Scanset

creative computing equipment evaluation



Terminal Velocity

John Anderson

Terminals. Those are for keypunch operators. They're the big, heavy, expensive things that cause eyestrain and tinges of green around the temples. Managers just don't deal with them, right? It would be demeaning. Or maybe that isn't really true anymore.

Wake up. That isn't true anymore. Managers who don't have them at their desks may be soon asked to clean out those desks entirely. Horrors! There is even a place for a terminal in the manager's home—if it is small, light, and inexpensive, of course.

Je Ne Sais Ma

In France, the national telephone company has embarked on an experiment. It is installing small, unimposing computer terminals next to the telephones in many homes. In the U.S., the phone company has attempted no such program. In contrast, the phone companies of a few states are attempting to levy staggering surcharges for the privilege of data communications over phone lines. This is a situation we'll be watching rather closely.

It is nevertheless possible, at modest expense, to attach your own small, unimposing terminal to the phone line, and, until Ma Bell finds an effective way to deter you, enjoy all the benefits thereof. In fact, the terminal we evaluated is a modified version of the terminal being distributed by the French. It is about 10" wide, 10" high, and 14" deep. That is remarkably small for the features it packs.

After having shown the Tymshare Scanset terminal to a few members of our staff, I got in the habit of holding a quick round of "The Price Is Right." "How much do you think it costs," I asked each victim, chuckling to myself. To the great credit of the Scanset, the whole crew overbid. Everyone was surprised at how much capability could be had for so little.

There are three models of the Scanset. The 410, for connection via RS-232-C to a computer or modem, can be had for $495. We received the 415, which has a built-in modem and modular jack for direct connection to the phone line. It lists for $649. Both models have an RS-449 connector for a serial printer. Another model will be introduced this fall. It will be similar to the 415, and include a telephone handset for under $1000.

The model 415 has some pretty special features. It stores and will automatically dial up to 36 numbers. If connection is established, automatic string transmission is available on four of the phone numbers. This means rekeying of access codes or sign-on protocols can be avoided.

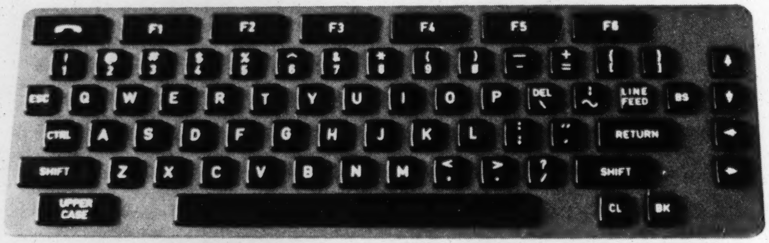
In addition, up to 12 other strings of 36 characters can be stored for later transmission at a single keystroke. Internal batteries store your directories in 2K of CMOS RAM, so they will be preserved when the unit is off or unplugged.

There is a built-in speaker, which allows the user to hear the dial tone and dialing sequence, and to determine whether a connection has been established.

The 9" diagonal screen has 40- and 80-character modes, and is very sharp and easy to read. If no key is pressed for more than about five minutes, the screen will blank until one is pressed.

Six function keys across the top of the keyboard simplify the command configuration. Commands appear directly above the function keys at the bottom of the CRT. The far right function key is labeled "Next" from the connect mode, and pressing this key will bring up the next set of command functions. This makes learning and operation of the Scanset a veritable breeze.

For the time I had the terminal on my desk, nearly all visitors would stop and stare a while. "Wow!" or "Neat" or "That's cute" were the kinds of comments elicited. And justifiably so. The Tymshare Scanset is miniaturized extremely nicely.



The "Chiclet" style keyboard. Better for chewing gum than for touch typing.

galaxy of features

A GALAXY of features makes the **LNW80** a remarkable computer. As you explore the **LNW80,** you will find the most complete, powerful, ready to run, feature-packed personal and business computer ever made into one compact solid unit.

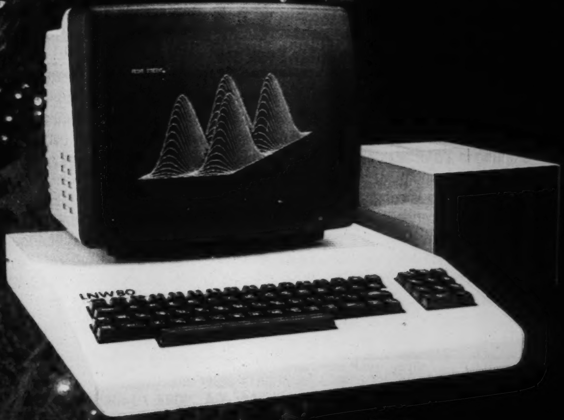
MODEL I COMPATIBILITY – The **LNW80** is fully hardware and software compatible with the Model I. Select from a universe of hardware accessories and software – from VisiCalc® to space games, your **LNW80** will launch you into a new world of computing.

FULLY LOADED – A full payload includes an on-board single and double density disk controller for 5 ¼" and 8" single or double sided disk drives. RS232C communications port, cassette and parallel printer interfaces are standard features and ready to go. All memory is fully installed – 48K RAM, 16K graphics RAM and 12K ROM complete with Microsoft **BASIC.**

QUALITY CONSTRUCTION – Instrumentation quality construction sets **LNW80** computers apart from all the rest. Integrated into the sleek solid steel case of the **LNW80** is a professional 74-key expanded keyboard that includes a twelve key numeric keypad.

HIGH RESOLUTION GRAPHICS & COLOR – The stunning 480 × 192 resolution gives you total display control – in color or black and white. The choice of display formats is yours; 80, 64, 40 and 32 columns by 24 or 16 lines in any combination of eight colors.

PERFORMANCE – Lift-off with a 4MHz Z80A CPU for twice the performance. The **LNW80** outperforms all computers in its class.



Our down to earth price won't send you into orbit

LNW Research Corp.
2620 WALNUT Tustin, CA. 92680
(714) 641-8850 (714) 544-5744

CIRCLE 202 ON READER SERVICE CARD

Monitor and Disk drives not included
TM Personal Software, Inc.

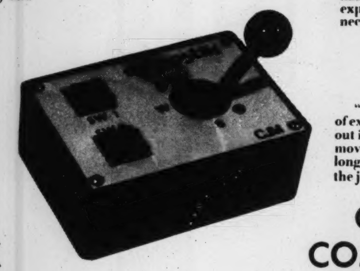
DO **YOU** WANT THE **BEST**
FOR YOUR **APPLE** OR **ACE** ?

"...suitable for use with games for which we normally recommend a switchtype joystick such as *Thief* and *Snack Attack*."

"...one of the few joysticks that could be substituted for a paddle in games which required precise adjustment (*County Fair, Tsunami, etc* "

"To overcome the connector vulnerability problem. CJM has gone to rugged but more expensive Cinch Jones connectors...."

"...the CJM Microstick is of excellent quality throughout its exceptionally easy movement coupled with the long throw may well make this the joystick of choice for you."



CJM
MICROSTICK
$59.95

CREATIVE
COMPUTING
AUG 1982

WRITE OR CALL TODAY
CJM INDUSTRIES
PO BOX 436
STERLING VA. 22170
703/430-0354
DEALER INQUIRIES INVITED

VISA
master charge

CIRCLE 139 ON READER SERVICE CARD

THE WALL STREET PLOTTER

For use with Apple™ Computer Systems

This program can help you make money, and it's so easy. Two separate price move indicators may be displayed with the standard high-low-close financial plot, the popular moving average, or a trend analysis of the trading cycle. The trend analysis overlays the trading cycle onto buy and sell zones resulting in a practical, easy to use price move indicator. Plots may be generated for any financial security, commodity, or market average.

This package is compatible with text files containing historical quotes captured from several of the popular quote services by any of the popular telecommunications packages. The package also includes a powerful line oriented text editor for manual data entries, deletions, or additions. Data Files may be created in whole or in part with the editor.

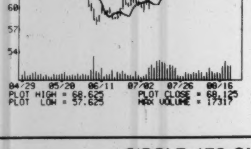
The package is compatible with all of the popular graphics printer and plotter drivers as well as our other product, The Superplotter.

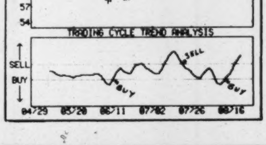
Requirements: 48K Apple™ II Plus with DOS 3.3
or Apple™ III in emmulation mode

Price $125.00

See your local dealer for a demonstration or order direct from:
478 Engle Dr. / Tucker, GA 30084 / (404) 491-7905
Outside Georgia: (800) 241-6753 ext. 503
VISA & MasterCard accepted Mail Orders Add $2.50 shipping and handling ($5.00 outside USA)

Dickens Data Systems





CIRCLE 178 ON READER SERVICE CARD

Scanset, continued...

Not Even Ladyfingers

No product is perfect, and though the Scanset 415 comes close, it does have a few problems. The keyboard is what editor Staples has termed "Chiclet" style—more suited to a calculator keyboard. The keys themselves are placed very close together. After an hour or so on the Scanset your hands begin to feel like ham roasts. This may have been a necessary trade-off for the size, but I can envision a full-stroke keyboard that might have been fitted onto the unit without much sacrifice. Then again, I have never designed a terminal.

One thing that definitely troubled me was the proximity and placement of the shift lock and shift keys. The shift lock is of the same size and placed directly below the shift key.

As a result, you will often find yourself mistaking "shift-lock" for shift. And, as the shift lock is a "reversing" toggle rather than a true lock, it is less than utterly straightforward to recover from such an error once it has been made.

Perhaps sharp people with tiny fingers will disagree with my criticism concerning the Scanset keyboard. I admit, I can be slow and stubby-fingered at times. To such folk I would only underscore that I feel it is an excellent product, filling a gap in the small terminal market for the home or business.

Compared with the current alternatives, the advantage of the Scanset is clear. You can opt for a full-sized, full stroke terminal, but be prepared to pay for it, and then find a place for it. Add to this the cost and placement of a modem. And, even then the configuration is not likely to offer sophisticated auto-dial and function directories as are available with the Scanset.

At the other end of the spectrum, you might consider a hand-held terminal or pocket computer with terminal program. While these units have the advantage of great portability, they are also extremely limited. A 20-character liquid crystal display can't really compete with a CRT screen. And I'd take the Scanset keyboard in a second when compared to the keyboards on most hand-held machines. Typing on these for an extended period is an excruciating experience. More importantly, the cost of the hand-helds plus modem is not much lower than that of Scanset. Okay, you can't drag a Scanset into a phone booth. But anywhere there is an electrical outlet, it wins hands down.

I looked at a preliminary version of the manual that accompanies the unit, and found it quite straightforward and well laid out.

For more information, contact Tymshare, 20705 Valley Green Dr., Cupertino, CA 95014. ☐

CIRCLE 376 ON READER SERVICE CARD

SUPER DISCOUNT PRICES

APPLE®

FOURTH DIMENSION

SUPER DRIVE (w/cont)	**$384.95**
SUPER DRIVE (wo/cont)	**$294.95**
DUAL DRIVE (w/cont)	**$984.95**

MICROTEK

APPLE DUMPING - GX	**$75.95**
PARALLEL INFC. CARD	**$67.95**
16K RAM (BAM-16)	**$75.95**

SOFTWARE FOR BUSINESS AND ENTERTAINMENT

BEAGLE BROS.	
Dos Boss (D)	$16.95
Alpha Plot (D)	$28.95
Utility City (D)	$20.95
Tip Disk #1 (D)	$14.95
Apple Mechanic (D)	$20.95
BRODERBUND SOFTWARE	
Choplifter (D)	$24.95
Star Blazer (D)	$22.95
Davids Midnight Magic (D)	$24.95
Apple Panic (D)	$20.95
Alien Rain "Galaxian" (D)	$17.95
The Arcade Machine (D)	$31.95
Serpentine (D)	$24.95
CAVALIER COMPUTER	
Bug Attack (D)	$20.95
Microwave (D)	$24.95
CONTINENTAL SOFTWARE	
The Home Accountant (D)	$52.95
The Home Money Minder (D)	$24.95
1st Class Mail (D)	$52.95
DATAMOST	
Snack Attack (D)	$20.95
Swashbuckler (D)	$24.95
EDUWARE	
Compu-Read (D)	$20.95
Spelling Bee w/Read. Prim. (D)	$28.95
Compu-Math/Arith. Skill (D)	$35.95
Algebra I (D)	$28.95
Algebra 2 (D)	$28.95
Algebra 3 (D)	$28.95
Fractions (D)	$35.95
Decimals (D)	$35.95
Counting Bee (D)	$20.95
Compu-Spell/System (D)	$20.95
Rendevous (D)	$28.95
SAT Word Attack (D)	$35.95
Prisoner (D)	$23.95
HAYDEN SOFTWARE	
Sargon II (D)	$24.95
Pie Writer/Standard (D)	$102.95
Pie Writer/Double Vis. (D)	$102.95
Pie Writer/Multi 80-Col (D)	$102.95
HOWARD SOFTWARE	
Tax Preparer 1982 (D)	$114.95
Creative Financing (D)	$134.95
Calif. State Tax Preparer (D)	$55.95
NY/NJ State Tax Preparer (D)	$55.95
Real Estate Anal. II (D)	$134.95
INFOCOM	
Zork I (D)	$28.95
Zork II (D)	$28.95
Deadline (D)	$35.95
INSOFT	
GraForth II (D)	$55.95
Electric Duet (D)	$20.95
LOTUS	
Executive Brief Sys. (D)	$136.95
MICRO LAB	
Data Factory 5.0 (D)	$202.95
MICROSOFT	
Olympic Decathlon (D)	$20.95
Typing Tutor II (D)	$17.95
Fortran-80 (D)	$134.95
A.L.D.S. (D)	$86.95
Basic Compiler (D)	$269.95
MultiPlan (D)	$189.95
MUSE	
Robot War (D)	$28.95
Castle Wolfenstein (D)	$20.95
Super Text 40/56/70 (D)	$86.95
ON-LINE	
HI RES Mission Asteroids (D)	$14.95
HI RES Mystery House (D)	$17.95
HI RES Wiz & Princess (D)	$23.95
HI RES Cranston Manor (D)	$24.95
HI RES Ulysses (D)	$24.95
HI RES Time Zone (D)	$69.95
Maurauder (D)	$24.95
Screenwriter II (D)	$89.95

ON-LINE (continued)	
Lisa 2.5 (D)	$55.95
Frogger (D)	$24.95
Cannonball Blitz (D)	$24.95
Screenwriter Profess'nl (D)	$134.95
PEACHTREE	
All Series	Call
PENGUIN SOFTWARE	
Complete Graphics Sys. (D)	$48.95
Special Effects (D)	$28.95
Graphics Magician (D)	$41.95
QUALITY SOFTWARE	
Ali Baba & 40 Thieves (D)	$23.95
Bag of Tricks (D)	$28.95
SENSIBLE SOFTWARE	
Super Disk Copy III (D)	$20.95
Multi Disk Catalog III (D)	$17.95
Disk Recovery (D)	$20.95
Dos Plus (D)	$17.95
Image Printer (each) (D)	$28.95
The Sensible Speller (D)	$84.95
SENTIENT SOFTWARE	
Congo	$24.95
Goldrush	$24.95
SIRIUS SOFTWARE	
EZ Draw 3.3 (D)	$35.95
Gorgon (D)	$28.95
Sneakers (D)	$20.95
Hadron (D)	$24.95
Fly Wars (D)	$20.95
Kabul Spy (D)	$24.95
Minotaur (D)	$24.95
Bandits (D)	$24.95
Way Out (D)	$28.95
SIR-TECH	
Wizardry (D)	$35.95
Knights of Diamonds (D)	$24.95
SOFTWARE PUBLISHING CORP.	
PFS: Report (D)	$66.95
PFS: Filing (D)	$86.95
PFS: Graph (D)	$86.95
SPINNAKER SOFTWARE	
Snooper Troops #1 (D)	$31.95
Snooper Troops #2 (D)	$31.95
Story Machine (D)	$24.95
Face Maker (D)	$24.95
STONEWARE PRODUCTS	
D.B. Master (D)	$157.95
D.B. Master Util #1 (D)	$69.95
Graphics Proc. Sys (Stand) (D)	$41.95
STRATEGIC SIMULATIONS	
Computer Quarterback II (D)	$28.95
Computer Baseball (D)	$28.95
Cytron Masters (D)	$28.95
Guadalcanal (D)	$41.95
S.E.U.I.S. (D)	$28.95
Galactic Gladiators (D)	$28.95
Battle of Shiloh (D)	$28.95
Tigers in Snow (D)	$28.95
Cosmic Balance (D)	$28.95
SUBLOGIC	
Flight Simulator (D)	$26.95
Pinball (D)	$21.95
Saturn Navigator (D)	$26.95
SYNERGISTIC SOFTWARE	
Odyssey (D)	$21.95
Atlantis (D)	$28.95
Global Prog Line Ed. (D)	$44.95
VISICORP	
Visicalc 3.3 (D)	$174.95
MISCELLANEOUS SOFTWARE	
Human Fly (D)	$20.95
Master Type (D)	$28.95
Micro Painter (D)	$24.95
New Step by Step (D)	$56.95
Sam (w/DAC) (D)	$86.95
Star Ship Command (D)	$28.95
Ultima (D)	$28.95
Zoom Graphics (D)	$28.95
3-D Supergraphics (D)	$28.95

ATARI®

We have the lowest price on 800 (48K) CALL

800 COMPUTER (48K)	**LOWEST**
PERCOM D/D DISK DRIVE	**$588.00**

810 DISK DRIVE	**$428.00**	**32K RAM (Mosaic)**	**$104.95**
410 RECORDER	**$74.00**	**32K RAM (Intec)**	**$74.95**
850 INTERFACE	**$164.00**	**48K RAM (Intec/400)**	**$139.95**
400 COMP (16K)	**$265.00**	**RAMDISK**	**$425.00**
ENTERTAINER	**$66.95**	**SIGNALMAN MK II**	**$78.95**
COMMUNICATOR	**$298.00**	**WICO JOYSTICK**	**$24.95**
BOOKKEEPER KIT	**$179.95**	**WICO TRACKBALL**	**$54.95**

SOFTWARE FOR ENTERTAINMENT AND EDUCATION

ADVENTURE INTERNATIONAL	
Rear Guard (D)	$17.95
Adventures (per set) (D)	$28.95
Adventures 1-12 Each (C)	$17.95
Preppie (C/D)	$20.95
War (D)	$18.95
Commbat (D)	$18.95
APX	
Eastern Front 1941 (C/D)	$22.95
Fam. Cash Flow (D)	$16.95
747 Landing Sim. (C/D)	$16.95
ATARI INCORPORATED	
Microsoft Basic (D)	$65.95
Macro Assem. & Editor (D)	$65.95
Assembler Editor (R)	$44.95
Basic Cartridge (R)	$44.95
Pac Man (R)	$32.95
Centipede (R)	$32.95
Caverns of Mars (D)	$28.95
Missile Command (R)	$26.95
Star Raiders (R)	$32.95
Asteroids (R)	$26.95
Conversational Lang.Ea.(C)	$43.95
Music Composer (R)	$30.95
Super Breakout (R)	$26.95
Computer Chess (R)	$26.95
My First Alphabet (D)	$25.50
Programming 2 & 3 (ea.) (C)	$21.00
Word Processor (D)	$107.00
Pilot (Educ)	$98.00
Touch Typing (C)	$19.00
Home File Manager (D)	$36.95
AUTOMATED SIMULATIONS	
Invasion Orion (C/D)	$17.95
Rescue at Rigel (C/D)	$20.95
Temple of Apshai (C/D)	$28.95
Star Warrior (C/D)	$28.95
Datestones of Ryn (C/D)	$14.95
Dragon's Eye (D)	$20.95
AVALON HILL	
Empire of Overmind (D)	$24.95
Voyager (D)	$17.95
B-1 Nuclear Bomber (C)	$12.50
Lords of Karma (C)	$14.95
Tanktics (D)	$20.95
BRODERBUND SOFTWARE	
Apple Panic (C/D)	$20.95
Star Blazer	$22.95
Choplifter (D)	$25.95
Davids Midnight Magic (D)	$24.95
HI RES Deadly Secrets (D)	$24.95
Steller Shuttle (C/D)	$20.95
DATA SOFT	
Text Wizard II (D)	$72.95
Canyon Climber (D)	$20.95
Pacific Coast Hwy (D)	$20.95
Clowns & Balloons (D)	$20.95
EDU-WARE	
Compu-Read (D)	$20.95
Compu-Math Frac. (D)	$28.95
Compu-Math Dec. (D)	$28.95
Compu-Read (C)	$14.95

INFOCOM	
Zork I (D)	$28.95
Zork II (D)	$28.95
Deadline (D)	$35.95
JV SOFTWARE	
Action Quest (C/D)	$20.95
Ghost Encounters (C/D)	$20.95
K-BYTE	
K-Razy Shootout (R)	$34.95
K-Star Patrol (R)	$34.95
K-Razy Kritters (R)	$34.95
K-Razy Antics (R)	$34.95
K-Dos (D)	$64.95
ON-LINE	
HI RES Wiz & Princess (D)	$23.95
Crossfire (C/D)	$20.95
Frogger (C/D)	$24.95
Threshold (D)	$28.95
Ultima I (D)	$28.95
Ultima II (D)	$43.95
The Next Step (D)	$28.95
OPTIMIZED SYSTEMS	
Basic A + (D)	$58.95
OS/A + (D)	$58.95
Speed Read Plus (D)	$42.95
ROKLAN	
Deluxe Invaders (D)	$24.95
Deluxe Invaders (R)	$28.95
Gorf (D)	$29.95
Gort (R)	$32.95
Wizard of Wor (D)	$29.95
Wizard of Wor (R)	$32.95
SIRIUS	
Space Eggs (D)	$20.95
Sneakers (D)	$20.95
Way Out (D)	$28.95
STRATEGIC SIMULATIONS	
The Shattered Alliance (D)	$28.95
Tigers In The Snow (C/D)	$28.95
Battle of Shiloh (C/D)	$28.95
SYNAPSE SOFTWARE	
File Manager 800 + (D)	$72.95
Protector (C/D)	$24.95
Shamus (C/D)	$24.95
Nautilus (C/D)	$24.95
MISCELLANEOUS SOFTWARE	
Ali Baba & 40 Thieves (D)	$23.95
Crypts of Terror (D)	$24.95
Dr. Goodcodes Cavern (D)	$20.95
Master Type (D)	$28.95
Pool 1.5 (D)	$24.95
Raster Blaster (D)	$20.95
Sam (D)	$42.95
Sammy the Sea Serpent (C)	$12.95
Warlocks Revenge (D)	$24.95
Visicalc (D)	$176.95
3-D Supergraphics (C/D)	$28.95

COMMODORE

VIC-20	**$182.95**
1530 RECORDER	**$63.95**
1525 PRINTER	**$314.95**
1540 DISK DRIVE	**$314.95**
VIC 16K RAM	**$87.95**

— MUCH SOFTWARE —

PRINTERS

NEC 8023A-C	**$469.00**
SMITH CORONA TPI	**$589.00**
AXIOM GP-100	**$269.00**

MONITORS

BMC 12" GRN	**$83.95**
BMC 13" COLOR	**$269.95**

D = DISK C = CASSETTE
R = ROM (CARTRIDGE)

THE ABOVE PRICES ARE FOR PREPAID ORDERS

WRITE FOR FREE CATALOG: INDICATE APPLE OR ATARI

COSMIC
COMPUTERS
UNLIMITED

ORDER LINES OPEN
MON-SAT 8 am - 9 pm
228 N. PROSPECTORS RD.
DIAMOND BAR, CA 91765

(714) 861-1265

APPLE IS A TRADEMARK OF APPLE COMPUTER, INC.
ATARI IS A TRADEMARK OF ATARI, INC.

Add $2.00 Shipping per software order anywhere in U.S. Non-U.S. software orders, add $5.00. Hardware Shipping, call for cost. Calif. residents add 6½% sales tax. Cashiers Checks or Money Orders filled same day. Personal checks require 4 weeks to clear. **Master Card and Visa OK for software only, add 3% surcharge.** Include card no., expiration date and signature. Prices subject to change.

CIRCLE 161 ON READER SERVICE CARD

The Better Bulletin Board System

Michael Coffey

creative computing
SOFTWARE PROFILE

Name: Communitree, the first edition
Type: Conference host software
System: Apple II or II+, 48K
Disk drive (2 recommended)
Hayes Micromodem II
Format: Apple K-Sector diskette
Summary: Start of a new wave in human communication.
Price: $195
Manufacturer:
The Communitree Group
470 Castro St., Suite 207-3002
San Francisco, CA 94114

Every so often, we read an article about the great potential of microcomputers as videotext devices, community memories, or replacements for the Postal Service. We decided to plug in a modem and try a few of these possibilities. In particular, we wanted to explore the potential of computers to enhance human communication.

All over North America, computer hobbyists have put together systems that act as bulletin boards. With any terminal, you can call these systems and correspond with numerous hobbyists. Normally, you don't have to pay to use these systems. Of course, your phone company will charge you for the call.

Then there is the Communitree system and the computerized conference movement. While the bulletin board systems usually assume that all callers are members of the computer culture, the conference systems try to make the computer subservient to the user's other interests.

Hitting the Boards

Feeling community minded, we signed on to one Community Bulletin Board system after another. Although we enjoyed exchanging messages with fellow computerists, we noticed problems. Foremost among these were difficulties with the operation of the BBS software. We had to learn an entirely new set of commands, many of which were hard to remember.

Each command on a BBS is a one-letter abbreviation of a longer English word. Because they designed the system capriciously as they thought of tricks they wanted to do with it, the BBS programmers ran out of initial letters before they ran out of functions. The BBS user, therefore, must contend with some very contrived mnemonic devices.

The basic command is R to read a message. A normal person might assume that to do the opposite, write a message, the thing to type is W. Not so, baud rate breath, you have to type E to write a message. E stands for Enter, get it? In the noncomputer world, when was the last time you entered something other than an entrance?

We are being unfair, in a way, because the BBS was invented for hard-core computerist conversation. For this purpose, the system is fully adequate.

New Users Need New System

The many people who buy computers for the first time need a good way to use the communicability of their new pets. At minimum, they need a system that does everything a BBS does without any need for computer buzzwords during normal use. They should be able to read messages immediately and should be able to send substantial messages within an hour.

The Communitree system provides advantages for every kind of user. You can get by with only two or three commands. The system recognizes only seven commands in all. Each command is an English word and can be abbreviated to its first letter.

The three main commands are Read, Browse, and Index. To read a message, type "read" followed by the name of the message you want to read. The system displays the entire text of the specified message, along with a list of the daughters of that message. Since the entire system is organized as a family tree, you can read every message by starting at the root and reading all the daughters and daughters of daughters.

To get acquainted with a new tree, read the message called "conferences," which is the special name for the root of the whole tree. You will be presented with a list of messages that you can take as a list of topics being discussed on the tree.

The Browse command works like the Read command except that it only shows the first line of each message. The Index command shows no message text, it merely displays the names of all the descendants of the message you name.

In a marvelous fit of consistency, the Communitree designers endowed all three commands with the same set of options. Whether you want to Read, Browse or Index, you can limit the action by exercising the "starting," "find," and "com-

valFORTH™ for Atari* 400/800

Professional Software for the Hobbyist

VALPAR INTERNATIONAL

FORTH has been used for years by ATARI* and others in programming their arcade games. FORTH is *fast*, 15-20 times faster than BASIC, and can make use of every capability for your computer. And it's no longer the province of the professional programmer! With valFORTH and the additional packages described below, you can create programs in an afternoon that would previously have taken weeks of hard work!

WHAT? YOU DON'T ALREADY KNOW FORTH?

Then take advantage of our special offer on *Starting Forth* by Leo Brodie. Widely acclaimed as the best book available on the subject, this entertaining treatment of Forth will make you comfortable with this exciting language quickly and easily. When you order *Starting Forth*, you get a free copy of our "Notes for the valFORTH User," including references, by page, to *Starting Forth*.

These are the utilities developed by Valpar International's software specialists and used to create our commercial software products.

valDOS

NEW! By Popular Demand!

valDOS. Now you can use your valFORTH system to read and write normal Atari DOS Files created with valDOS or other sources. Also includes valDOS File Editor for creating and reading FORTH Source Code without "screens." (Not a general file editor.)

(Over 25 pages of documentation. Requires valFORTH.)

valFORTH T.M.

Package contains: fig-FORTH kernel with mathematical and stack operations machine-coded for higher speed than normal fig-FORTH; line editor AND screen editor, debugger, sound and graphics commands, floating point, advanced 6502 assembler, diskcopiers, and much more! (Over 110 pages of documentation)

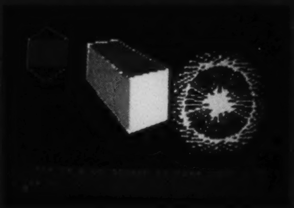
GENERAL UTILITIES AND VIDEO EDITOR

Utilities: 4 array types, 4 case types, text on graphics 8, extensive string manipulation and keyboard input, STICK & PADDLE, randoms, bit manipulation, and much, much more.

Editor: *fast, powerful, complete* valFORTH screen editor 1.1. A professional-quality tool that makes editing a pleasure.

(Over 60 pages of documentation. Requires valFORTH.)

PLAYER-MISSILE GRAPHICS, CHARACTER EDITOR, & SOUND EDITOR



Player-Missile: Create, move, color, change images of and bound players and missiles with high level commands. Full support of 5th player, multicolor players, etc. etc. All critical sections in machine code.

Character Editor: Compose character sets with joystick. Simultaneous display of created characters. Make images for players and missiles.

Sound Editor: Simple independent control of all four voices (one joystick per voice) and audio-control register. Create any single-setting sound with graphical and tabular readout.

(Over 35 pages of documentation. Requires valFORTH.)

VALPAR INTERNATIONAL
3801 E. 34TH STREET
TUCSON, ARIZONA 85713
Call Toll-Free 800-528-7070   In Arizona call (602) 790-7141

Principal Software Authors: Stephen Maguire and Evan Rosen

Atari is a trademark of Atari, Inc., a division of Warner Communications

Coming Attractions
- * TARGET COMPILER
- * 3D WORLD

For more information *fast* and a 4TH ♥ IF HONK THEN bumpersticker, send 25¢ and a self-addressed, stamped envelope.

DISPLAY FORMATTER

Fast, simple creation of all types of display lists, with automatic 4K boundary jumping. Automatic or user controlled memory allocation, and formatting for horizontal and vertical scrolling, and display list interrupts.

(Over 30 pages of documentation. Requires valFORTH.)

TURTLE & valGRAPHICS™ AND ADVANCED FLOATING POINT ROUTINES

All graphics modes supported — even GTIA and "7+". Draw and fill commands *faster* and *smarter* than Basic. "Turn-toward" for "chasing" and vanishing point effects; point labeling, etc. Also SIN, COS, ATN, ATN2, etc. added to floating point.

(Over 35 pages of documentation. Requires valFORTH.)

Text Compression and Auto Text Formatting

A unique, two-part utility!

- Text Compression allows the packing of text into much less space than normally required. Useful for wordy Adventure games, "artificial intelligence," etc.!
- Auto Text Formatting takes both normal and compressed text and routes it to the video screen "windows."

(Over 20 pages of documentation. Requires valFORTH.)

valFORTH alone requires 24K
valFORTH plus one or more packages requires 32K minimum
Memory requirements include 10-12K working space.
All products are now on non-protected disks.
Over 270 pages of detailed documentation!

valFORTH	$45.00
General Utilities and Video Editor	40.00
Player Missile Graphics, Character Editor, and Sound Editor	40.00
Display Formatter	35.00
Turtle and valGraphics and Floating Point Routines	45.00
Text Compression and Auto Text Formatting	35.00
Heavy-Duty Professional Binder (provided free when ordering 3 or more packages at one time)	13.00

* Save $50.00 *
With an order of all six packages above, you pay only $203.00.

Starting Forth (published at $15.95)	14.00
valDOS and valDOS File Editor	$40.00

When ValForth and one or more additional packages are purchased and proof of purchase of APX Forth is furnished, a $15.00 credit will be given.

Plus Shipping and Handling

VISA and MASTERCARD accepted

CIRCLE 306 ON READER SERVICE CARD

plete" options. Here are some examples of how the options work:

```
read FLOWER complete
```

would display the message called "flower" and all its descendants.

```
browse FLOWER starting 8-aug-82
```

would show all descendants of "flower" that are dated on or after August 8, 1982.

```
read FLOWER find daisy
```

displays messages tied to "flower" that contain the string "daisy"

Because these English-like commands are uncomfortably long for repeated typing, the system lets you abbreviate each option to a single letter. The longest example above becomes:

```
b FLOWER s 8-aug-82
```

The less frequently used options for Read, Browse, and Index are Beyond, Exiled, and Onlyexiled. Here are some examples:

```
r FLOWER beyond WATERING
```

displays descendants of "flower" that come after the message called "watering"

```
b FLOWER exiled
```

displays descendants of "flower" including those that are scheduled for deletion. Only by specifying "exiled" or "onlyexiled" can you look at moribund messages.

```
i FLOWER onlyexiled
```

shows names of only those messages belonging to "flower" that have been scheduled for deletion.

```
WELCOME TO THE CONFERENCE TREE

TERMINAL LINE LENGTH (20-80,
  OR CARRIAGE RETURN FOR 80)?40
LOWER CASE OK (C/R=YES)?

TYPE 'READ HELP' ANY TIME
OR 'READ CONFERENCES' TO START

'S' KEY TO PAUSE OR RESUME PRINTING

APEX NETWORK HARDWARE SOFTWARE TOPICS
OF INTEREST. APPLE/// USERS LINE

COMMAND?  R CONFERENCES

*** CONFERENCES             0-JAN-80
  PARENT= NONE                USAGE=688
CURRENT CONFERENCES ON THIS CONFERENCE
TREE SYSTEM ARE:
     +++ SUBMESSAGES +++
 HELP                     16-JUL-81
 USERS                    16-JUL-81
 SYSTEM                   16-JUL-81
 INQUIRY-TREE              1-JUN-82
 PROBLEMS??               13-JUN-82
 HOURS                    13-JUN-82
 APPLE.II                 13-JUN-82
 FOLLK                    17-JUN-82
 DUMB.JOKE.BRANCH          9-JUL-82
 ASK.TECH                 12-JUL-82
 FOR.SALE                 12-JUL-82
 OS-9                     12-JUL-82
 CP/M                     13-JUL-82
 APPLE.///                13-JUL-82
 FINANCIAL-SUPPORT        23-JUL-82
 BOOKS.&.THINGS            2-AUG-82
 MAKE-SUM-MONEY           19-AUG-82
```

Listing 1. Getting an overview of a tree. Conferences *is the name of the trunk of any tree. Each submessage has a set of submessages that you can read.*

Making Your Mark

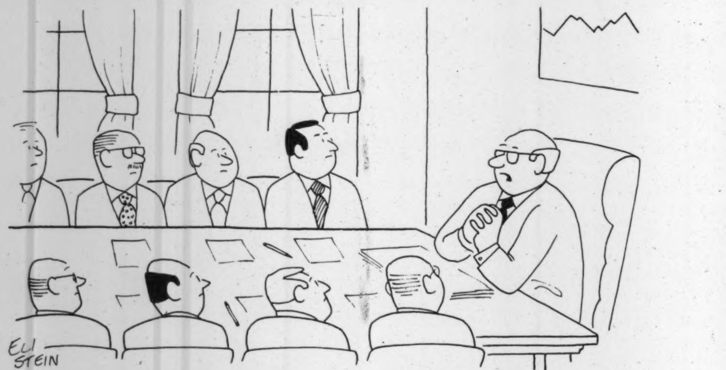
We all enjoy reading databases. However, for many of us, contributing our own remarks provides even more excitement. We like the idea of having untold numbers reading our words, reacting to them and, perhaps, benefiting from the process.

To contribute to the tree, just decide which message needs your amendment, amplification, or answer. Then type "addto," followed by the name of the message you selected. Here is an example:

```
addto FLOWER
```

Now the system asks for the name of your new message. If you want to talk about a rose, type the name rose. The system will ask you to verify or change the current date and permit you to begin typing the text of your message. You may type as many as 50 lines of text. When finished, you press the return key one extra time.

The only problem comes when you make an error or change your mind about what you want to say. The system is not very good at helping you change things you have already typed. Changing something on the same line you are working on works all right, but changing a previous line requires typing that whole line over again.



"I want no interruptions, gentlemen—everyone please disconnect his pocket bleeper."

The Communitree people would probably like to provide a full screen editor on their system, but such an editor would require a herculean programming effort if it were to work with all the different types of equipment that tie into the tree. For now, the old-fashioned backspace-and-retype line editor must suffice.

One very interesting fact about the Communitree system is that you need not sign your messages. Of course, you can stick your name, initials, or pseudonym in the last line if you like. Anonymity can encourage a degree of frankness that is not commonly found in face to face conversation.

The Care and Feeding of Trees

The system stores the text of each message on disk along with some other information about it, including name and date. The system also keeps all message names and auxiliary information in RAM so that it can find things as quickly as possible.

A tree that grows unchecked will eventually fill a disk. You can add more disk drives, but the system can keep track of only 321 messages before it runs out of RAM. Naturally, you need a way to control the growth of the tree.

When messages become obsolete, boring, or offensive, you can remove them from the tree. This process is called

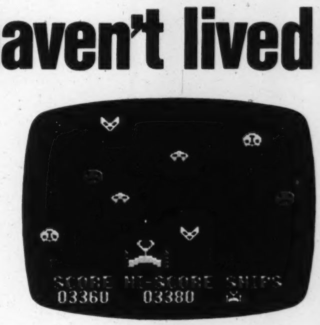
NOW also available in Atari format!!!

ALIEN ambush™

WHAM
ALONE IN AN UNCHARTED GALAXY, YOU'RE SUDDENLY AMBUSHED BY AN ALIEN MARAUDER. INSTINCTIVELY, YOU FIRE YOUR LASERS. HITTING THE ATTACKER, YOU WATCH IN HORROR AS IT SPLITS INTO TWO MENACING CRAFT. YOU GROW DESPERATE AS MORE ALIENS CAREEN TOWARDS YOU...

by Peter Fokos

You haven't lived until you've died in space.


SCORE HI-SCORE SHIPS
03360 03380

And here's your chance.

Software author Peter Folkos has created Alien Ambush, a space age nightmare. It's a hi-res, full-color arcade game, fiendishly written to give those nasty aliens every advantage.

So if you have access to a 48K Apple* with DOS 3.3 or a 16K Atari 400/800** with a disk drive, and you're hot for some new thrills, Alien Ambush was written for you. But be warned: it just got a lot tougher to survive in space.

*Apple is a trademark of Apple Computer, Inc. **Atari, Atari 400 and Atari 800 are trademarks of Atari, Inc.
Distributed exclusively by Micro D, 17406, Mt. Cliffwood Circle, Fountain Valley, Ca. 92708 (714) 540-4781

CIRCLE 231 ON READER SERVICE CARD

```
COMMAND?  R MJC

*** MJC                      15-AUG-82
  PARENT=USERS                     USAGE= 35
Michael Coffey, Technical Editor,
Creative Computing, 39 E Hanover Ave
Morris Plains, NJ 07950,  201-540-0445

        Technical specialties include
Apple II and III, CP/M, Pascal,
Fortran, WP, and database management.
Actually, I'm not very specialized
at all.  Nontechnical specialities
include communication, animation,
dance,
and roller skating.
          I would love to hear about
better software for conferencing
and about better computers that are
easier to use.

                               Thanks for
being there ...
     +++ SUBMESSAGES +++
 HIYA!!!                 16-AUG-82
 VIC-20                  18-AUG-82
 HI-MIKE                 14-SEP-82

COMMAND?  A MJC

  DISK IS  36 PERCENT FULL
SYSTEM DATE IS      14-SEP-82
C/R IF OK, ELSE DD-MMM-YY:
YOUR MESSAGE NAME? DEMO-MESSAGE
ENTER MESSAGE.  EMPTY LINE (C/R ALONE)
TO LEAVE ENTRY MODE.
LINE  1:
-     THIS IS A DEMONSTRATION OF HOW
LINE  2:
-TO ENTER A MESSAGE ON THE CONFERENMCE
LINE  3:
-TREE.  NOTE THAT TYPOGRAPHICAL ERRORS
LINE  4:
-APPEAR IN THIS LISTING.
LINE  5:
-     THIS MESSAGE IS CALLED DEMO-MESSAGE
LINE  6:
-AND IT IS TIED TO THE MESSAGE CALLED MJC
LINE  7:
-

THE EDITOR COMMANDS ARE: LIST, REPLACE,
CONTINUE, QUIT, AND SAVEPERMANENT

EDITOR COMMAND? SAVEPERMANENT

WAIT A MOMENT...

COMMAND?  R DEMO-MESSAGE

*** DEMO-MESSAGE             14-SEP-82
  PARENT=MJC                       USAGE=  1
     THIS IS A DEMONSTRATION OF HOW
TO ENTER A MESSAGE ON THE CONFERENCE
TREE.  NOTE THAT TYPOGRAPHICAL ERRORS
APPEAR IN THIS LISTING.
     THIS MESSAGE IS CALLED
DEMO-MESSAGE
AND IT IS TIED TO THE MESSAGE CALLED
MJC
     +++ NO SUBMESSAGES +++
```

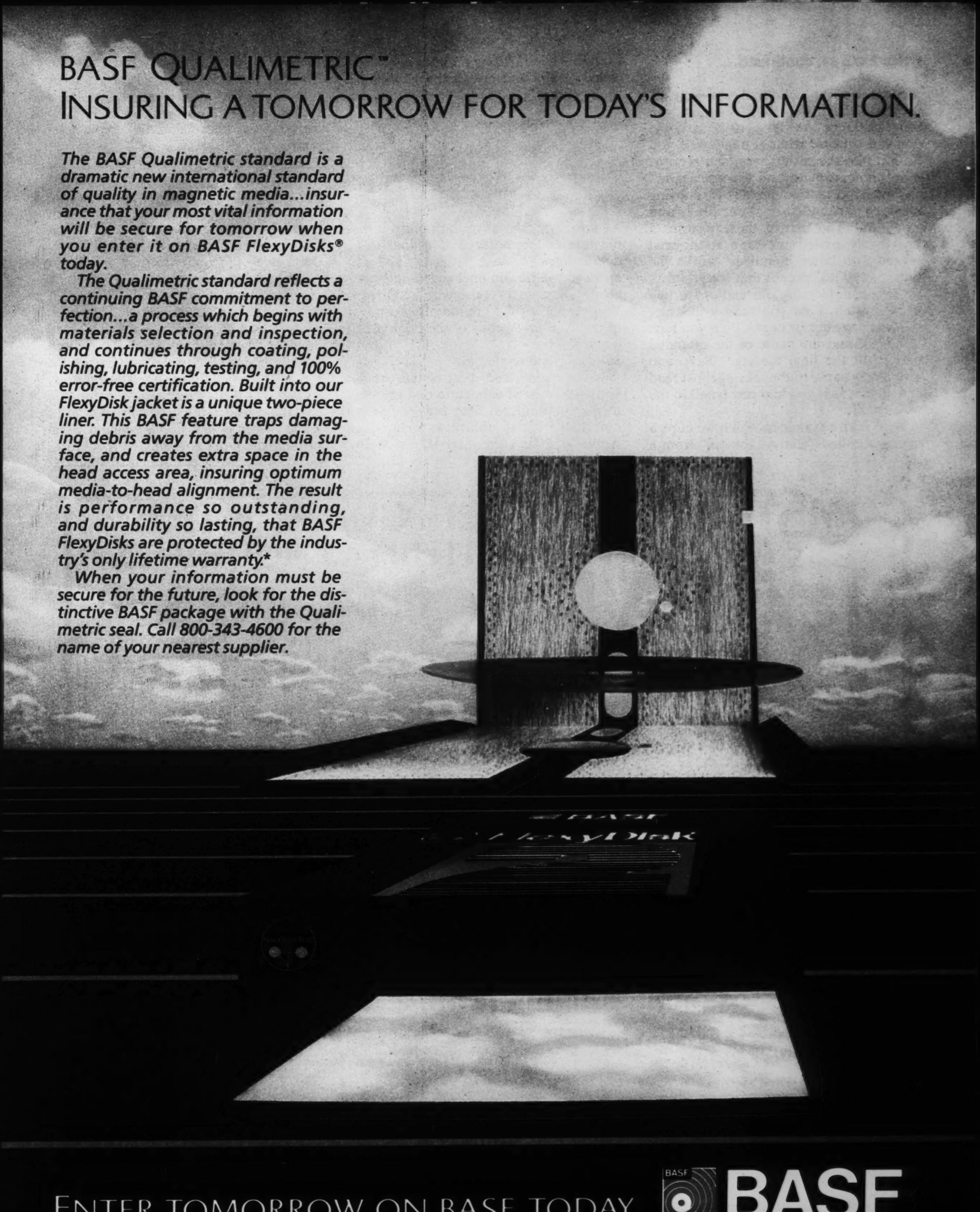
Listing 2. Adding a message. First, we read a message, then we add a new submessage. Our new message, Demo-Message, *is a branch of* MJC *which is a branch of* Users.

```
COMMAND?  I DUMB.JOKE.BRANCH

DUMB.JOKE.BRANCH
          9-JUL-82   84
 BAD-JOKE
          9-JUL-82   50
  MOUSE
         12-JUL-82   41
   MARIN
         16-JUL-82   31
 VITAMIN
         12-JUL-82   40
  HORMONE
          1-SEP-82   15
 RAPIST
         12-JUL-82   40
 DUCK
         12-JUL-82   39
 L2
         12-JUL-82   37
 L2.CORRECTED
         12-JUL-82   33
 WE'RE.FREINDS,RIGHT?
         12-JUL-82   30
 %CLONE-HEADS
         14-JUL-82   27
 ELEPHANT
         16-JUL-82   24
 BBZZZZZZZZZ...OUCH!
         16-JUL-82   24
 WILD,WILD-WESV
         19-JUL-82   31
 NEW-WAVE
         19-JUL-82 · 34
  WAVE-NEW
         27-JUL-82   26
   NOWIMREALLYCONFUSED
         27-JUL-82  . 27
 DAR.DE.DOOO!
         27-JUL-82   21
 SHOCKING
         29-JUL-82   22
 TENNIS.ANYONE?
         30-JUL-82   22
 BUNNY
         30-JUL-82   22
 THE*FAMILY*
         30-JUL-82   22
 NOW.SERIOUSLY,FOLKS
         30-JUL-82   20
 DIRTY-JOKE
         31-JUL-82   22
  AND.THEN
         28-AUG-82   11
 SURVEY-WARP
          2-AUG-82   22
 CHARGE!!!
          2-AUG-82   22
  DEW.DROPS
          2-AUG-82   20
 BUMPER-SNICKER-2
          3-AUG-82   18
 BUMPER-SNICKER-3
          3-AUG-82   16
 BUMPER-SNICKER-4
          3-AUG-82   17
 BUMPER-SNICKER-5
         12-AUG-82   20
 BUMPER-SNICKER-6
         16-AUG-82   16
 ALMOST...
         26-AUG-82   19
  THANK.YOU...
         26-AUG-82   16
```

Listing 3. Reviewing a branch. The Index *command displays the names, dates, and number of times used, of every message under a branch.*

pruning and consists of two steps. The first step is to *exile* the messages that should go away. Any user who knows the password can type "exile" followed by the message name to mark a message and all its offspring for later deletion. Only the system operator can complete the second step of the process, which is to *squeeze* the disks.

When a message has been exiled, it becomes harder to access but remains on the system, taking up space. When you squeeze the disks, the exiled messages and their offspring become overwritten by other messages, and previously used space becomes available. Since squeezing a disk can cause large bodies of data to disappear, the Communitree people



BASF QUALIMETRIC™
INSURING A TOMORROW FOR TODAY'S INFORMATION.

The BASF Qualimetric standard is a dramatic new international standard of quality in magnetic media...insurance that your most vital information will be secure for tomorrow when you enter it on BASF FlexyDisks® today.

*The Qualimetric standard reflects a continuing BASF commitment to perfection...a process which begins with materials selection and inspection, and continues through coating, polishing, lubricating, testing, and 100% error-free certification. Built into our FlexyDisk jacket is a unique two-piece liner. This BASF feature traps damaging debris away from the media surface, and creates extra space in the head access area, insuring optimum media-to-head alignment. The result is performance so outstanding, and durability so lasting, that BASF FlexyDisks are protected by the industry's only lifetime warranty.**

When your information must be secure for the future, look for the distinctive BASF package with the Qualimetric seal. Call 800-343-4600 for the name of your nearest supplier.

ENTER TOMORROW ON BASF TODAY BASF

*Contact BASF for warranty details © 1982, BASF Systems Corporation, Bedford, MA

CIRCLE 122 ON READER SERVICE CARD

recommend that you make a copy of the data disks before performing the squeeze. Once you have made a copy, you can squeeze without anxiety. If you do not like the results, you can recopy, move things around, and squeeze again.

Two important commands for moving messges around are "unexile" and "+addto." The first of these restores a previously exiled message to normal status. The latter command works the same as "addto" except that it starts with some text in memory, instead of starting from scratch. First you read a message you want to alter or move, then you type "+addto" and the name of the intended parent for the final message. Next, you give a new name to the message just read and alter it as if you had just typed in the whole text.

Here is an example in which we copy a message called "cherry-blossom" from a branch called "flower" into a branch called "fruit" and give it the new name "baby-cherry":

```
read CHERRY-BLOSSOM

+add to FRUIT

(computer asks for new message name)

BABY-CHERRY
```

At this stage, we have the ability to list the text of the message, add lines to it, delete lines, or save it as is. The old message will remain unchanged unless we go on to exile or otherwise modify it. With "+addto," we are merely creating a (possibly altered) copy of the original.

Summary and Evaluation

If you understand most of this article, you know almost enough to operate your own communitree. The only other requirement is the ability to plug in an Apple II, disk drive, and Hayes Micromodem II. If you understand only the first half of the article, you are almost fully equipped to use someone else's Communitree. You need to be able to turn on your terminal and dial your telephone.

To all observers at *Creative Computing,* the *Communitree* system showed distinct advantages over the generic bulletin board systems. Beginning users can appreciate the relative simplicity of the Communitree command structure. Heavy users enjoy the ability to read only those messages that are worth their time. Of the conference systems now available for 64K computers, *Communitree* is the best. We hope that many programmers will emulate the Communitree designers and their concern for appropriate design for the user and fulfillment of a carefully formulated goal. Their strong points are carefully orchestrated details, not frills. Their weak points are intelligent compromises, not cut corners. ☐

COMSTAR'S WRITTEN GUARANTEE

AIR*SHIPPING WITHIN 48 HOURS

*CONT. U.S.A.
*EXCEPT SOME HARDWARE

ATARI

32K RAM............$ 85
48K RAM............ 125
NEWPORT PROSTICK....$ 31
VOICE BOX............ 139

	LIST	NOW
STAR CONCENTRATION (T)16K	$ 14.95	$ 10
PREPPIE (D,T)16K	29.95	23
CENTIPEDE (C)	49.95	34
TRACK ATTACK(D)48K	29.95	23
CANYON CLIMBER (D,T)16K	29.95	23
CLOWNS & BALLOONS (D,T)	29.95	23
FROGGER (D,T)16K	34.95	26
BATTLE OF SHILOH (D,T)48K	39.95	29
TIGERS IN THE SNOW(D,T)48K	39.95	29
NAUTILUS (D,T)32K	34.95	26
SLIME (D,T)16K	34.95	26
EASTERN FRONT (D,T)16K	29.95	24
REAR GUARD (T)16K	19.95	17
MICROSOFT BASIC (D)32K	89.95	67
BASIC A+ (D)32K	80.00	62
CYCLOD (D)48K	29.95	23
SNAKE BYTE (D)48K	29.95	23
ADVENTURELAND (T)24K	24.95	20
RICOCHET (D,T)16K	19.95	17
WORDRACE (D)32K	24.95	20

	LIST	NOW
MACRO ASSEMBLER(D)32K	$ 89.95	$67
ASSEMBLER EDITOR (C)	59.95	46
PILOT (C)	79.95	59
LETTER PERFECT (D)24K	149.95	112
TEMPLE OF APSHAI(D,T)32K	39.95	29
INTRUDER (T)16K	29.95	23
ACTION QUEST (D,T)16K	29.95	23
CROSSFIRE (D,T)16K	29.95	23
ALI BABA (D) 32K	32.95	25
RASTER BLASTER (D)32K	29.95	23
CAVERNS OF MARS (D)16K	39.95	29
PAC MAN (C)	44.95	34
PROTECTOR (D,T)32K	34.95	26
CHICKEN (D,T) 16K	34.95	26
VALFORTH (D)16K	45.00	36
ZORK I OR II (D)32K	39.95	29
POOL 1.5 (D)48K	34.95	26
K-RAZY SHOOTOUT (C)	49.95	38
THRESHOLD (D)40K	39.95	29
VISICACL (D)32K	250.00	199

(C) = CARTRIDGE (D) = DISK (T) = CASSETTE

apple

	LIST	NOW
DAVID'S MIDNIGHT MAGIC	$ 34.95	$ 26
STAR BLAZER	31.95	25
LABYRINTH	29.95	23
DUELING DIGITS	29.95	23
CHOPLIFTER	34.95	26
ZORK I OR II	39.95	29
WIZARDRY	49.95	38
SWASHBUCKLER	34.95	26
BASIC COMPILER (DATASOFT)	99.95	79
ROACH HOTEL	34.95	26
RENDEZVOUS	39.95	30
PEEPING TOM	34.95	26
HI RES FOOTBALL	39.95	30
CROSS FIRE	29.95	23
THRESHOLD	39.95	30
PEGASUS II	29.95	23
FROGGER	34.95	26
STAR BLASTER	29.95	23
CONGO	34.95	26
GOLDRUSH	34.95	26
TWERPS	29.95	23
CYCLOD	29.95	23
BATTLE OF SHILOH	39.95	30
TIGERS IN THE SNOW	39.95	30
VISICALC 3.3	250.00	199
PINBALL	29.95	23

TRS-80

	LIST	NOW
BASKETBALL (D) I,III	20.95	$ 18
LOST COLONY (D,T)I,III	29.95	24
FAMILY TREE (D,T)I,III	29.95	24
ADVENTURELAND (T)I,III	24.95	21
ELIMINATOR (T)I,III	19.95	17
TEMPLE OF APSHAI(D,T)I,III	39.95	31
RESCUE AT RIGEL(D,T)I,III	29.95	24
RICOCHET (D,T) I,III	19.95	17
CURSE OF RA (D) I,III	19.95	17
EMPIRE OF OVERMIND(T)I,III	30.00	24
GALACTIC TRILOGY (D)I,III	39.95	31
GALACTIC EMPIRE(T)I,III	14.95	13
GALACTIC TRADER(T) I,III	14.95	13
GALACTIC REVOLUTION(T)I,III	14.95	13
SCARFMAN (D) I,III	19.95	17
SARGON II (T)I,III	29.95	24
PENETRATIR (D,T)I,III	24.95	21
FORTRAN-80 (D) I	100.00	80
BASIC COMPILER (D) I	195.00	147
EDITOR/ASSEMBLER+ (D) I	49.95	39
EDITOR/ASSEMBLER+ (T) I	29.95	24
LEVEL III BASIC (T) I	49.95	39
BATTLE OF SHILOH (T)I,III	39.95	31
TIGERS IN THE SNOW(T) I,III	39.95	31
FLIGHT SIMULATOR(T) I,III	25.00	21
DANGER IN DRINDISTI(D)I,III	19.95	17

HEAR ATARI SOUNDS THROUGH YOUR STEREO SPEAKERS WITH

STEREODAPTER — FOR ATARI 800

• NO ASSEMBLY REQUIRED • CAN USE STEREO HEADPHONES

• SHIELDED CABLE • ADJUST TONE & VOLUME WITH STEREO CONTROLS

STEREODAPTER WITH 16 FT CABLE $8 WITH 26 FT CABLE $10

DEALER INQUIRIES INVITED

COMSTAR

P.O. BOX 1730
GOLETA, CA 93116
(805) 964-4660

ORDERS ONLY: CALL TOLL FREE 800-558-8803 MON-FRI 11-7

IN CALIF. (805) 964-4660 or send check, money order or credit card number and exp. date. Include $2 shipping for software (call for hardware). Add 3% for Visa or MC (except Calif.). Calif. add 6% tax. There is a $2.50 charge for COD. Please include type of computer.

CIRCLE 157 ON READER SERVICE CARD

FIRST: MONSTER MOVIES NOW: CRUSH, CRUMBLE & CHOMP! THE GREAT MOVIE MONSTER COMPUTER GAME!

I.R.S
USE ZIP CODES
POST OFFICE
A.T.
SERVIC

And guess who stars as the movie monster. You! As any of six different monsters. More if you have the disk version.

You can terrorize and destroy four of the world's largest and most densely populated cities in over 100 possible scenarios. From Tokyo to the Golden Gate, you are the deadliest creature in the air, on the land, or in the sea.

You can be the deadly amphibian who simultaneously smashes street cars, lunches on helpless humans and radiates a ray of death.

If you were a giant winged creature, think of the aerial attacks you could make on the terrified but tasty tidbits beneath you.

But as in all the best monster movies, you're up against everything the human race can throw at you—even nuclear warheads and a strange concoction developed by a team of mad scientists.

For only $29.95 you get 6 stupendous monsters, each with its own monstrous summary card, 4 teeming metropoli displayed in graphic detail on your computer display and mapped in the accompanying 48-page illustrated book, the awesome sounds of monsterly mayhem, and spine-tingling, real-time, edge-of-your-seat excitement.

GET CRUSH, CRUMBLE & CHOMP
now at your local dealer for your APPLE, ATARI, or TRS-80 . . **before it's too late.**

EPYX
COMPUTER GAMES THINKERS PLAY

CIRCLE 117 ON READER SERVICE CARD

SEASON'S GREETINGS

HARDWARE

FRANKLIN	CALL
ALTOS	CALL
IMS	CALL
VIC 20	CALL
	HAYES
CHRONOGRAPH	224
MICROMODEM II	289
SMARTMODEM	224
1200 BAUD SMARTMODEM	589
	MICROSOFT
Z80 SOFTCARD	279
ENHANCER II	119
	C. ITOH
PROWRITER 100 CPS	489
PROWRITER 120 CPS	639
PROWRITER 15"	789
F10-55 CPS	1799
F10-45 CPS	1449
	IDS
PRISM PRINTER 80	789
PRISM PRINTER 132	1689
	OKIDATA
MICROLINE 80	359
MICROLINE 82A	489
MICROLINE 83A	739
MICROLINE 84A	1179

SOFTWARE

CP/M ★ IBM

	MICROPRO
★ WORDSTAR	279
★ SUPERSORT	154
★ MAILMERGE	89
★ DATASTAR	239
★ SPELLSTAR	149
★ CALCSTAR	189
	MICROSOFT
BASIC COMPILER	299
BASIC 80	279
COBOL 80	559
MACRO 80	139
muSIMP/muMATH	199
MULTIPLAN	219
	ASHTON-TATE
★ dBASE II	529
	FOX & GELLER
★ QUICKCODE	249
★ dUTIL	68
	SORCIM
★ SUPERCALC	189
	FORCE II
MATHSTAR	99
	ISA
★ SPELLGUARD	189
	OASIS
★ WORDPLUS	149
	MICROSTUFF
★ CROSSTALK	117

SOFTWARE

APPLE

	VISICORP
★VISICALC	184
★VISIDEX	184
VISIPLOT	158
★VISITERM	79
★VISITREND	239
VISIFILE	184
DESKTOP PLAN II	184
★DESKTOP PLAN III	184
	MICROPRO
WORDSTAR	224
SUPERSORT	119
MAILMERGE	79
DATASTAR	189
SPELLSTAR	129
CALCSTAR	139
	MICROSOFT
TASC APPLESOFT COMPILER	149
TIME MANAGER	119
FORTRAN 80	149
COBOL 80	539
A.L.D.S.	99
	SORCIM
SUPERCALC	189
	ISA
SPELLGUARD	189
	OASIS
WORDPLUS	149

CALL TOLL FREE: 1-800-523-9511

IN PA: 1-215-868-8219

SEASON'S GREETINGS TO THE MICROHOUSE MANUFACTURERS

- ALTOS
- AMDEK
- ANADEX
- ASHTON-TATE
- BAYAD
- CALIFORNIA COMPUTERS
- C. ITOH
- COMSHARE TARGET SOFTWARE
- DENVER SOFTWARE
- EAGLE SOFTWARE
- ELEPHANT
- EPSON
- FORCE II
- FOX & GELLER
- FRANKLIN
- HAYDEN
- HAYES
- INTEGRAL DATA SYSTEMS
- INTERACTIVE STRUCTURES
- INNOVATIVE SOFTWARE APPLICATIONS
- INFORMATION UNLIMITED SOFTWARE
- MAXELL
- MICROPRO
- MICROSOFT
- MICROTEK
- MORROW
- MOUNTAIN COMPUTERS
- M&R
- MICROSTUFF
- NEC
- NOVATION
- OASIS
- OKIDATA
- PERFECT SOFTWARE
- PEACHTREE SOFTWARE
- QUADRAM
- SANYO
- SCITRONICS
- SILICON VALLEY SYSTEMS, INC.
- SORCIM
- SORRENTO VALLEY ASSOCIATES
- SYNETEX
- SYSTEMS PLUS
- TCS
- TELEVIDEO
- VENTEL
- VIDEX
- VISICORP
- WABASH
- ZENITH

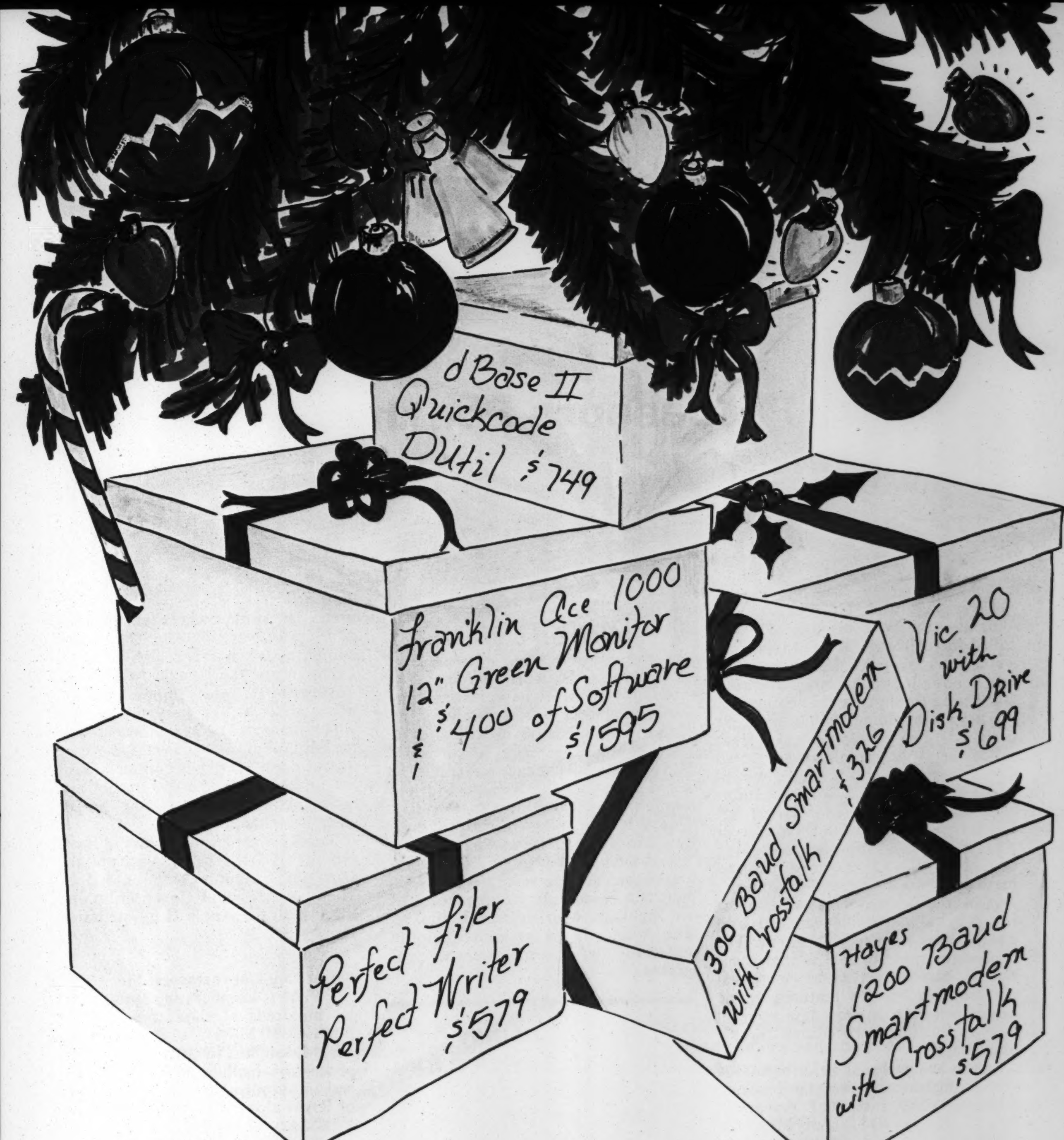
DEALERS INQUIRIES INVITED

MICROHOUSE

1444 LINDEN ST./P.O. BOX 498, BETHLEHEM, PA 18016

PRICES AND AVAILABILITY SUBJECT TO CHANGE

CIRCLE 232 ON READER SERVICE CARD


dBase II
Quickcode
DUtil $749
Franklin Ace 1000
12" Green Monitor
$400 of Software
$1595
Vic 20
with
Disk Drive
$699
300 Baud Smartmodem
with Crosstalk
$326
Perfect Filer
Perfect Writer
$579
Hayes
1200 Baud
Smartmodem
with Crosstalk
$579

HOLIDAY PACKAGES

CALL US ABOUT YOUR FREE GIFT WITH PURCHASE

New Processors For the Apple II

Michael Coffey

Long ago and far away, Steve Wozniak (the Woz) discovered a chip called the 6502. He decided to design a computer around it. For the past five years, countless engineers have been competing to improve that computer.

The most radical engineers have designed boards containing other processors to complement the 6502. The first such board to become popular was the Softcard, which contains a Z80 and is distributed by Microsoft Consumer Products. Since then, other Z80 boards and boards containing 6809s, 8088s, 68000s, and specialized math processors have been announced.

As a consumer, you may be wondering why you would want to add another processor to your Apple. The reason for most people is that these boards can deliver either increased performance or new features. Some can deliver both. In every case, you will have to learn new procedures to use a new board.

In this article, I shall describe boards containing the following processors: Motorola 6809, Intel 8088, Advanced Micro Devices 9511, and Motorola 68000. Each board comes with software and a manual. The prices range from $345 to $975.

The Mill by Stellation Two

When Stellation Two first announced The Mill, I was curious because the 6809 is supposed to be a big improvement over the 6502 in efficiency and programming. However, I knew that good software would have to be provided in order for the new chip to be worth buying. The Stellation people have earned my highest respect for assembling an impressive collection of software for their board.

The first Mill package was called the Pascal Speedup Kit. With the Mill and Stellation's enhancement to the Apple Pascal system, your Pascal programs can run up to twice as fast. When I tested the package, I found only slight improvements. However, fellow members of a Pascal user group have tested the package with its recent updates and found it to be quite helpful, especially with math-oriented programs.

> ***The 88Card may be the card of choice for any business software developer who owns an Apple II.***

Next, Stellation introduced a 6809 assembler that works with Apple DOS 3.3. The assembler is moderately powerful — on a par with the Apple DOS Toolkit assembler or Lisa. Not wanting to learn a new assembly language, I have not studied it in great detail. This assembler would be most useful to Apple owners who wish to develop software for other 6809-based computers, such as the TRS-80 Color Computer or the Hitachi MB6890.

Stellation's most important software product has been a package which includes OS-9 and Basic09 with the Mill for a price of $495. OS-9 is an operating system that contains many useful features borrowed from Unix, including multitasking and hierarchical file directories.

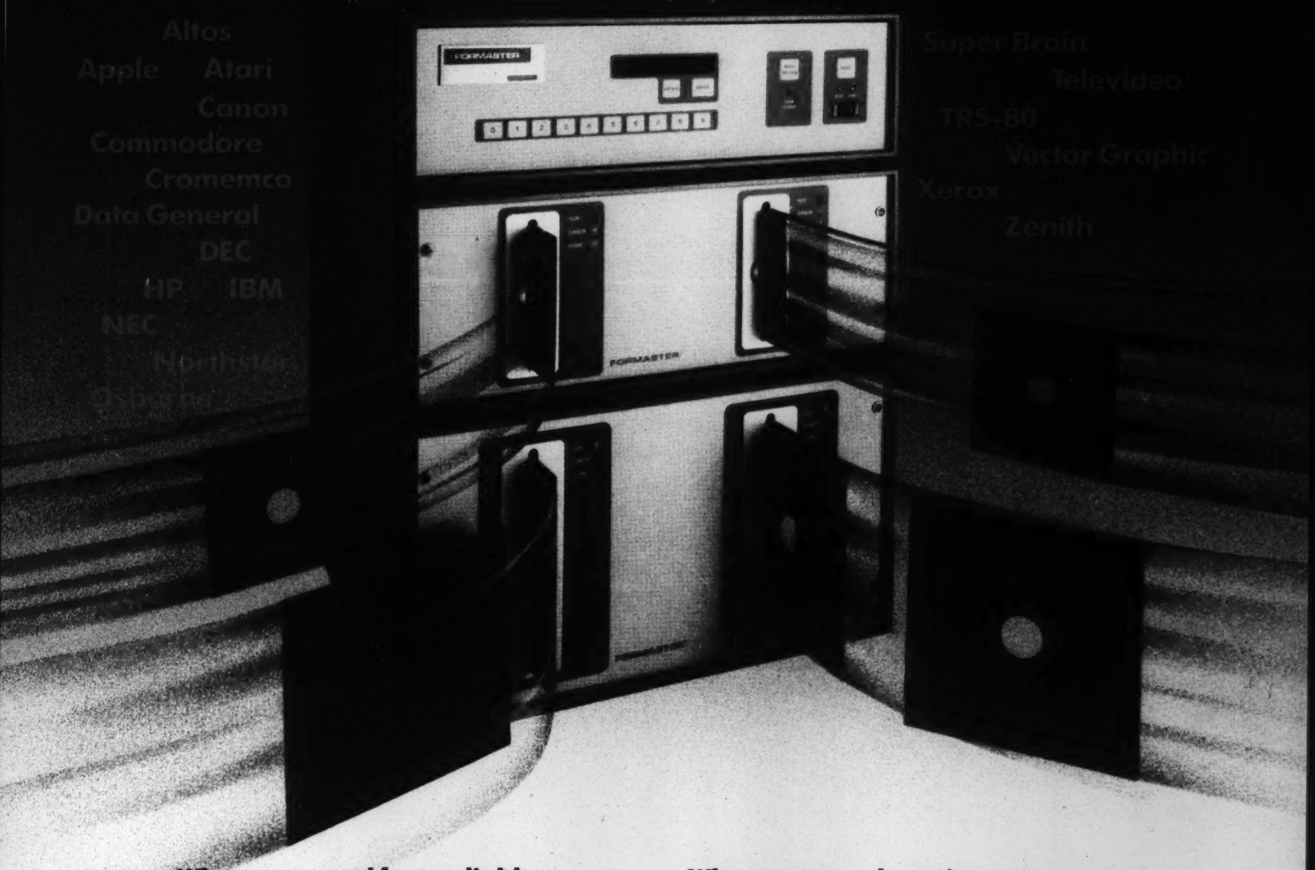
Basic09 is an elegant hybrid of Basic and Pascal. Both the language and the operating system were published by Microware Systems Corporation and adapted to the Apple II by Stellation Two.

88Card by Coprocessors, Inc.

CP/M is an operating system used by hundreds of thousands of computers. CP/M-86 is a new version of CP/M designed for Intel's new microprocessors, including the 8088. Coprocessors supplies an 8088 card with 64K of RAM along with a disk containing CP/M-86, all for $899.

Since CP/M-86 can be used on the DEC Rainbow 100, the IBM PC, and most other new business computers, the 88Card may be the card of choice for any business software developer who owns an Apple II. Of course, several other vendors are planning products very similar to the 88Card. As we go to press, Coprocessors is the only company that has managed to ship a working CP/M-86 system to *Creative Computing.*

FORMASTER™ Diskette Duplicators do the job...


Altos
Apple
Atari
Canon
Commodore
Cromemco
Data General
DEC
HP
IBM
NEC
Northstar
Osborne
Super Brain
Televideo
TRS-80
Vector Graphic
Xerox
Zenith
FORMASTER
FORMASTER

...When you need fast, reliable production—up to 326 diskettes per hour on dual-drive systems. Automatic loading options are available.

...When you need total copy accuracy—guaranteed by error-checked RAM, computerized verification of both source and copies, and concentric diskette positioning.

...When you need to work with any diskette format—including Apple, Commodore, and other complex GCR formats. We're the experts in format technology.

...When you need piracy protection—our sophisticated recording techniques can defeat virtually all forms of illegal software copying.

...When you need maximum operator simplicity—ten minutes will train the most junior operator. Add another ten minutes for setting up automatic software serialization.

With millions of diskettes processed on FORMASTER diskette duplicators, we've made life easier for a lot of people. Call us at (408)942-1771 to see how we can do it for you.

FORMASTER CORPORATION*

Technology That Works For You T.M.

2102 Ringwood Ave., San Jose, CA 95131 *formerly Acorn Systems, Inc.

CIRCLE 195 ON READER SERVICE CARD

Learn it in a FLASH

michael shrayer's

ELECTRIC

pencil

TM

word processing system

- **Easy to Learn** – Like lightning you will be up and running with a comprehensive and sophisticated word processor. Our manual says you can be an expert in one hour, our users tell us it takes less than 30 minutes. The manual's 128 pages are packed with figures, illustrations and examples for the beginner and"old pro".
- **Easy to Use** – With the ELECTRIC PENCIL you process words, not commands. ELECTRIC PENCIL's menus and simple two keystroke commands keeps your mind on your work, NOT on your manual. ELECTRIC PENCIL is so easy to use your secretary will WANT to use it... so sophisticated you'll be glad she did. David Ahl, the editor of Creative Computing says, "ELECTRIC PENCIL 2.0 is the most user friendly word processing package available."
- **Features** – ELECTRIC PENCIL has a 36k+ text buffer (48k disk system), supports disk, tape and Stringy Floppy files (disk version)* and has every major feature you want in a word processor. It is "bullet proof" – Data recovery is a built-in feature. The exclusive DICT-A-MATIC† feature gives your office the flexibility of dictation-word processing without fancy equipment. Your dictation playback is controlled from the computer keyboard.
- **Flexible** – It is the only word processing system that is designed like an operating system. You can add new programs and features to ELECTRIC PENCIL, such as RED and BLUE PENCIL dictionary/correction – with a 50,000 word dictionary (sold separately) – without patches and upgrades. Simply press one of the control key combinations and new additions to your system are instantly available. Add automatic proofing, spelling correction, dynamic print formatting, proportional printing, communications, graphics and typesetting and many other add-on features when you need them.
- **Versatile** – ELECTRIC PENCIL runs on TRS-80 model I and model III computers under all versions of TRSDOS, and NEWDOS without modification or patching (Patches required for other operating systems). It also supports parallel and serial printers as well as single and double density disk systems.

ELECTRIC PENCIL is the choice of thousands - make it yours for only $89.95 (disk version) or $79.95 (tape and Stringy Floppy versions). Manual only $24.95.

ELECTRIC PENCIL is available at computer stores, selected B. Dalton Booksellers and selected independent book dealers. If your dealer is out of stock, order direct (specify disk tape or Stringy Floppy version). Include $4.00 for shipping and handling. Foreign residents add $11.00 plus purchase price, in U.S. funds.

*Tape and Stringy Floppy versions support tape and stringy files only

IJG
1953 West
11th Street
Upland, CA
91786 (714)
946-5805

Stringy Floppy trademark EXATRON Corp
NEWDOS trademark APPARAT, Inc.

TRS80, TRSDOS trademark TANDY Corp

† trademark IJG, Inc

CIRCLE 207 ON READER SERVICE CARD

Basic09, The Elegant Hybrid

As a language cynic, I was prepared to ridicule Basic09 as yet another nonstandard implementation of the ancient and honorable beginners all-purpose symbolic instruction code. I was stunned to discover that Basic09 combines the friendliness of Basic and the logical structure of Pascal without imposing too many nasty inconsistencies. If I were to build my own algebraic programming language, I would make it look very much like Basic09.

Important legacies from Pascal include named procedures, structured data types, and advanced loop statements. Programs need not contain line numbers. Procedures can call themselves, and all variables are local to the procedure invocation in which they are used.

Unlike Pascal, Basic09 will not let you nest procedures within procedures. This rule disallows multiple procedures with identical names and forces all shared data to be passed as parameters. Named constants and explicit pointers are also missing from Basic09. The lack of pointers makes some programs difficult to translate from Pascal.

With Basic09, you get most of the familiar Basic features. Input statements can prompt the user, and strings are fully implemented, as in Applesoft or Microsoft Basic. File input and output are fully integrated into the language, not pasted on as in Applesoft. The Read... Data...Restore suite, missing from most Pascals, and only partially implemented in Applesoft, is fully functional in Basic09.

I used the Basic09 editor/compiler to enter several programs. The system caught many syntax errors as soon as I typed them. Others were caught when I crossed from the Edit mode to the System mode. I enjoyed having a chance to fix errors before running my programs.

Basic09 flips into Debug mode whenever it encounters an error or user interruption during a program run. This handy mode allows you to display values of variables and other indicators of program status. You can also wade through the program, statement by statement. When I first learned to program, I had to simulate that function by hand on paper and pencil. Although I wish the debugging commands were integrated into the System mode, I am satisfied with the provided set of features.

You can learn the program line editor in just a few minutes. Unfortunately, the main reason for this ease of mastery is the lack of powerful editing features. You will never mistake this editor for a word processor because you can not easily change existing lines. You must issue a Change command, retyping the old version of the text piece you want to change followed by the new version.

Basic09 incorporates many important advantages for serious programmers. All operating system facilities, including multitasking and file maintenance, are available within all Basic09 modes and user programs. For example, your Basic09 program could read a disk directory and display a list of file names before asking the user to choose a file to read.

Programmers will find I/O implemented more sensibly in Basic09 than in most other systems. You use all sequential files (e.g., most disk files) the same way you use all sequential I/O devices (e.g., keyboards, printers). Consequently, you can write programs without regard to the origin or destination of data, leaving the decision to the user. The file system makes no distinction between direct-access and sequential disk files. Therefore, you can write files using one technique and read them using the other.

The I/O statements are quite well designed, especially when compared to Applesoft. You can keep many files open at the same time and never get bogged down with channel numbers or other rigamarole. Ordinary Basic Input and Print commands can be used with any file. The Read and Write commands are similar to Input and Print, but are specialized for use with files, making it easy to put multiple values on each line of a file.

For random access to records, you use the Seek command which skips to the specified byte of a file. Get and Put perform high-speed data transfers between variables and files, performing no interpretation or conversion of binary data representations.

The Create command initializes disk files. The Open command associates operating system file names with Basic variables for use in subsequent I/O statements. The Close statement terminates access to a file, frees the memory associated with it, and (in the case of disk files) forces data to be recorded permanently. Finally, you can use Delete to get rid of files you don't need.

The Basic09 package is a very worthwhile system, especially for computer science students and companies with programming staffs.

I booted the Coprocessors system, and found it works much like every other CP/M system I have used. My biggest problem was that I had no CP/M-86 applications to run. CP/M-86 has only a few enhancements over regular CP/M (now called CP/M-80). The best of these, from the user point of view, is a Help command.

Other new commands in CP/M-86 include TOD and COPYDISK. TOD can set or read the time of day, and COPYDISK duplicates a CP/M-86 disk. In CP/M-80, these functions are performed by third-party programs.

CP/M-86 offers many benefits to the assembly language programmer. The ability to manage large chunks of memory and the ability to move programs up to MP/M-86 (the multiuser system) and Concurrent CP/M-86 are foremost among them.

The 88Card implementation of CP/M-86 contains a few surprises. The system disk, for example, contains no disk formatting program. I had to use the Apple DOS INIT command. The COPYDISK command works only with two disk drives, and the entire system is designed with an 80-column display in mind. Rumor has it that newer versions of the software will include a formatting program.

The general unfriendliness of CP/M has not prevented it from becoming a standard for business software developers. Many programming languages are already available for CP/M-86, and virtually every major 8080 and Z80 software developer is now polishing 8086 software for marketing as soon as possible. Why not jump on the bandwagon?

In the 8088 arena, CP/M-86 has one major competitor. IBM supplies an 8088 disk operating system called PC-DOS. That operating system is owned by Microsoft who sell it under the name MS-DOS. The differences between the current versions of MS-DOS and CP/M-86 are quite subtle. Both systems are direct derivatives of regular CP/M. I expect that MS-DOS will soon be released for the 88Card. Many software developers have told me that they intend to support both systems. Therefore, you needn't worry about buying the "wrong" operating system.

AD8088 by ALF

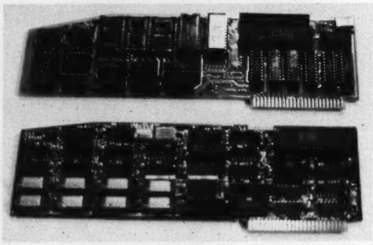
Intel, one of Silicon Valley's giants, has designed the 8088 chip to replace the 8080 as an industry standard. Companies as diverse as IBM, Microsoft, and Digital Research have decided to support this new Intel product, and no fewer than four companies have announced 8088 boards for the Apple II. One of the great frustrations of the past year has been the lag between announcement and delivery of some of these boards.

> ***The AD8088, as hinted above, is the first in a series of ALF boards that will work together to soup up your Apple.***

ALF Products, best known for their wonderful line of music products for the Apple, have turned their Apple expertise toward a new set of performance enhancing boards, the first of which contains an 8088, some ROM, and just a little bit of RAM (2K), all for just $345.

The ALF AD8088 card comes with software that makes Applesoft run faster. The system requires a 16K RAM card in slot 0. When you have installed the ALF system, nearly every Basic program in your library will run faster. Even compiled programs and some machine language programs will experience performance improvements.

ALF always provides excellent documentation with their products. The AD8088 was easy to install and use. I just plugged in the card, typed RUN FTL and the slot number of the card. From that point until DOS was rebooted (or the computer turned off), the 8088 helped Applesoft run faster.



Two 8088 cards. On top is ALF's AD8088, which supports Applesoft and can hold 12K RAM. Below is Coprocessor's 88 card, which supports CP/M-86 and contains 64K RAM.

I tried the system with a function plotting program. The program computes many sines and cosines and plots hundreds of points. I ran the program with and without the AD8088. I also compiled the program using Speedstar and ran the compiled version with and without the AD8088. The results are shown in Table 1.

Table 1.

	Without AD8088	**With AD8088**
Basic	34 seconds	15 seconds
Compiled	26 seconds	7 seconds

As you can see, the card outperformed the compiler when used separately. The combined performance of the compiler and the ALF system is astounding. Performance improvements will vary with the type of program. I was able to concoct some programs which showed no improvement at all, by either method.

Peripherals Unlimited...

FANTASTIC PRICES!

OUR FAST SERVICE, PRODUCT SELECTION AND OUR CUSTOMERS' SATISFACTION MAKE US #1.

Microsoft Z-80 Softcard	$214
Microsoft RAMCARD	$129
Z-90-64K DO	$2588
Z-19 Terminal	$777
Z-121 Monitor 12"	$149

ATARI COMPUTERS

Atari 800 16K	$649
Atari 400	$318
Atari Interface Module	$174
Atari 810 Single Disk	$444
Atari 830 Modem	$166
Programmer	$59
Entertainer	$84
Star Raiders	$34
16K Mem. Exp. for Atari	$74
32K Mem. Exp. for Atari	$114

NEC PRINTERS

7710/30 Spinwriter R/O	$2295
7720 Spinwriter KSR	$2649
3510/30 Spinwriter R/O	$1689

NEC DOT MATRIX

PC-8023	$474

Call for prices on ribbons, etc.

OKIDATA & MORE

Okidata Microline 82A	$459
Okidata Microline 83A	$699
Okidata Microline 84 (P)	$1069
Okidata Microline 84 (S)	$1099
Tractor (OKI 80 & 82 only)	$60
Diablo 620	$1349
Diablo 630	$1999

AMDEK & NEC MONITORS

Amdek 12" 300 GRN Phospor	$149
Amdek 13" Color I	$319
Amdek 13" Color II	$739
Amdek 13" Color III	$429
NEC JB1201 GRN Phospor	$149
NEC JC1201 Color	$339

EPSON PRINTERS

MX-80 w/Graphtrax Plus	$469
MX-80FT (Friction & Tractor)	$529
MX-100 (15" Carriage)	$699
Grappler Interface	$129

Call for prices on Ribbons, Cables & Interfaces

NEC-PC 8000 Series Microcomputer

PC-8001A Computer w/32K	$888
PC-8012A w/32K + Exp. Slots	$588
PC-8031A Dual Mini Disk	$888
PC-8032A Add-on Mini Disk	$777

Call for Software Prices

FOR THE LOWEST PRICE CALL

TOLL FREE

1-800-343-4114

ORDERING INFORMATION

Our order lines are open 9AM to 6PM EST Monday thru Friday. Phone orders are welcome: same day shipment on orders placed before 10AM. Free use of Mastercard and VISA. Personal checks require 2 weeks clearance. Manufacturer's warranty included on all equipment. Prices subject to revision. C.O.D.'s accepted.

For service, quality and delivery call:

PERIPHERALS UNLIMITED
(617) 655-7400
62 N. Main St. • Natick, MA 01760

CIRCLE 268 ON READER SERVICE CARD

EVERYONE NEEDS A . . .

BATTERY 6 MINUTES
V•AC LINE
BATTERY 2 MINUTES
GUARDIAN ANGEL™
RH ELECTRONICS, INC.
MONITOR — MICRO COMPUTER
DISC DRIVE
PRINTER

UNINTERRUPTABLE POWER SOURCE

ADVANCED DESIGN
NEW RELIABILITY
GUARDIAN PROTECTS
ELECTRONIC SAFETY
LIFESAVER FOR DATA

$595

SAVE YOUR DATA FROM POWER OUTAGES!

BACKUP FOR YOUR COMPUTER, MONITOR, PRINTER AND 5¼" FLOPPY AND HARD DISC DRIVE

• Automatically stops annoying problems from power line interruptions and brown outs • You need standby power to save data • Maintenance free backup power available in 115 volt or 220 volt • 50 or 60 HZ • 150 watts • Complete versatility — operate your system from a 12 volt source, i.e., automobile cigarette lighter, boat or airplane • Rugged self contained gel cell battery • No voiding warranty — no cutting wires • Automatic audio alarm warning tone during commercial power failure or interrupt • UL listed • FCC approved • Transient voltage suppressor gives added insurance from line voltage spikes, utilizing Zener Ray™ • Green/red LED power status indicator • Green — normal AC line power • Slow blinking red — at least 6 minutes of remaining standby power • Fast blinking red — approximately 2 minutes of remaining battery power • Solid state technology unexcelled by any UPS power unit in its class.

RH ELECTRONICS, INC.

COPYRIGHT © 1981 - PATENTS PENDING
566 IRELAN, BUELLTON, CA 93427
(805) 688-2047
CIRCLE 298 ON READER SERVICE CARD

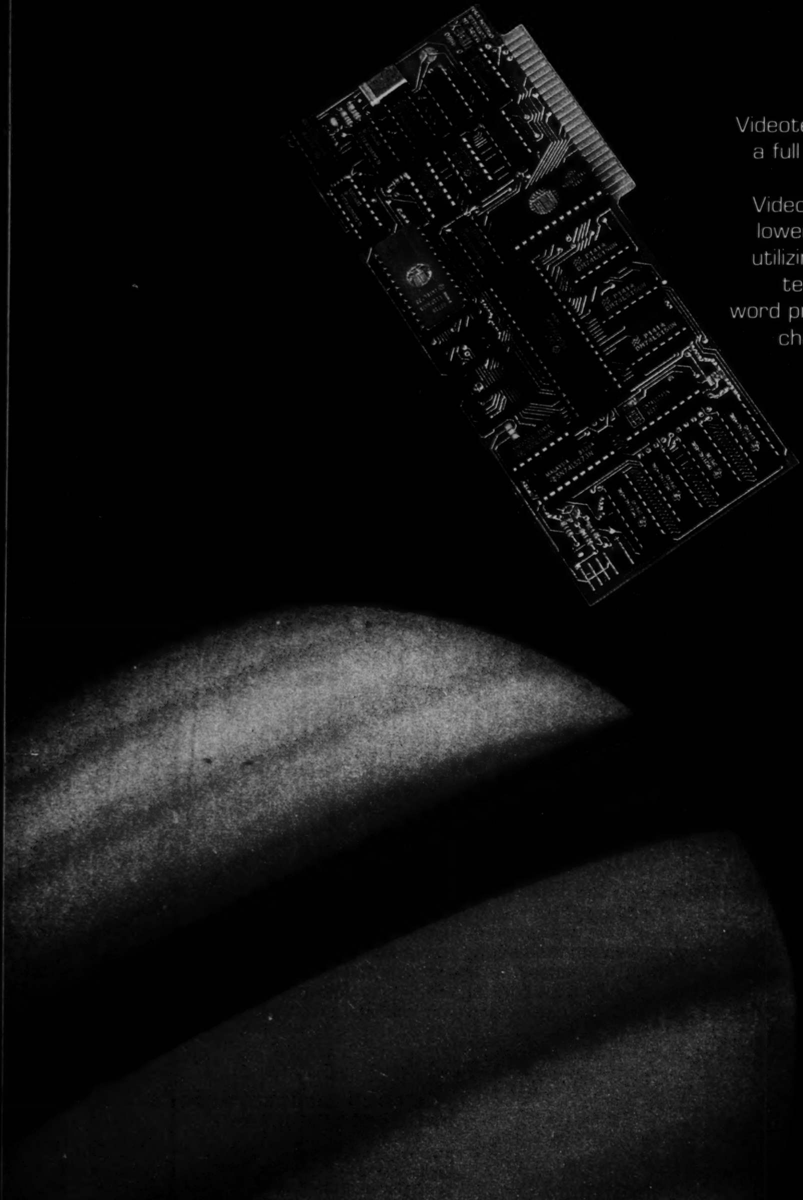
SEE YOUR RH ELECTRONICS PRODUCTS DEALER

FOR YOUR APPLE II*:	
SUPER FAN II™	$ 74.95
SUPER FAN II™/ZENER RAY™	$109.00
SUPER RAM II™	$125.00
RH 12 VOLT TRANSVERTER	$149.00
FOR MICRO COMPUTERS:	
GUARDIAN ANGEL™	$595.00

VIDEOTERM
Expanding Horizons in Text Display

Videoterm increases your Apple][® display to a full capacity 80 columns. Proofreading text problems are a thing of the past. With Videoterm your text is displayed in upper and lower case characters with true descenders utilizing a 7 by 9 character matrix. The time-tested Videoterm is compatible with most word processors and is available with alternate character fonts. Once you've explored the advantages of Videoterm, you'll discover a whole new world for you and your Apple][.

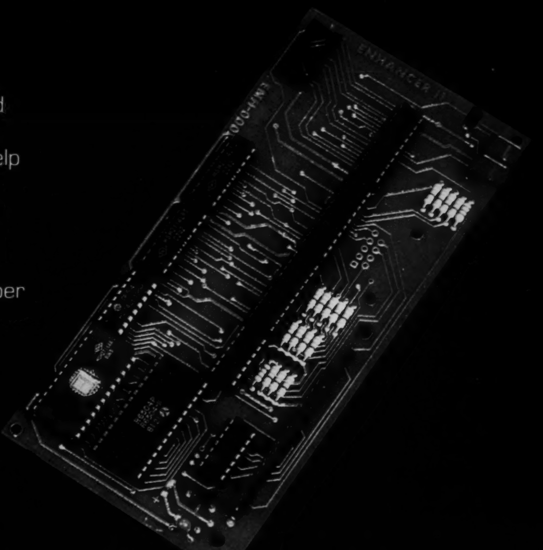
Suggested retail price: $345.00



Videx INC T.M

ENHANCER][

The Dawn of a New Era for Apple][

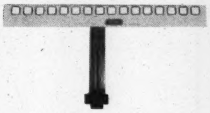


Introducing the Enhancer][: a new Standard which is improving the relationship between Humans and Apples. The Enhancer][can help your Apple]['s keyboard become more sociable by remembering words or phrases which can be entered into the Apple by the mere touch of a key. Life can become even easier because the Enhancer][can remember what you typed while your Apple was busy talking to your disc (or doing other things). Naturally, it knows the difference between upper and lower case letters and what shift keys are supposed to do. It even knows to auto repeat any key held down. The Enhancer][replaces the encoder board making installation simple.

Suggested retail price: $149.00

See us at Comdex, Booth 773

Function Strip™

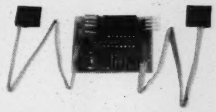


With the Videx Function Strip you can dedicate keys for your macro definitions, program word processor commands, words or phrases for your Enhancer][, Apple][™ Function Keys. VisiCalc® users can define often used commands and file names to a single keystroke.

This low cost, versatile strip of pressure sensitive switches adheres to the Apple]['s lid and connects to the Enhancer]['s keypad connector port.

Suggested price: $79.00

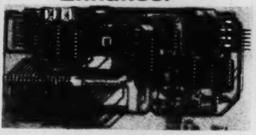
Soft Video Switch™



The Soft Video Switch is an automatic version of the popular Switchplate. It knows whether it should display 40 or 80 columns or Apple graphics. It does the tedious work of switching video-out signals so you don't have to. The Soft Video Switch can be controlled by software. Any Videoterm with Firmware 2.0 or greater may be used with the Soft Video Switch. The single wire shift mod is also supported.

The price is: $35.00

Keyboard and Display Enhancer™



The original Keyboard & Display Enhancer is still available for Revision 0-6 Apples (on which the new Enhancer][will not fit). These Apples have memory select sockets at chip locations D1, E1 & F1. The Keyboard & Display Enhancer allows entry and display of upper and lower case letters with fully functional shift keys. It does NOT have user definable keys nor a type ahead buffer.

Suggested price: $129.00

Accessories

Videoterm Utilities Disc (includes) •Font Editor •Mid-Res Graphics •Applesoft Read Screen Utility •Top & Bottom Scrolling •Pascal Vidpatch •Graphics Template	$37
Character Set EPROMs •Inverse •German •Katakana (Japanese) •Russian •French •Math & Greek Symbols	$29
High light, low light character set	$49
Dvorak EPROM (Enhancer)	$29
Lower Case Chip	$29

Apple and Apple][are registered trademarks of Apple Computer, Inc.
VisiCalc is a registered trademark of Personal Software, Inc.
Videoterm, Enhancer][, Function Strip, Soft Video Switch, Keyboard & Display Enhancer, Switchplate, and Videoterm Utilities Disc are trademarks of Videx, Inc.

897 N.W. Grant Ave. • Corvallis, Oregon 97330 • 503/758-0521

CIRCLE 194 ON READER SERVICE CARD

Sirius™ All Star Games

PHANTOMS FIVE
TYPE ATTACK
FLY WARS
LEMMINGS
commodore
VIC-20
CYCLOD
BANDITS
Sirius
TWERPS
MINOTAUR
ESCAPE FROM RUNGISTAN
BEER RUN
SNEAKERS
Space Eggs
"It Will Crack You Up"
Sirius
Jellyfish
KABUL SPY
CALL TO ARMS
WAYOUT
Beany Bopper
WORM WAR I
Fast Eddie
DEADLY DUCK

SUPER FUN!

All software represented in this advertisement are copyrighted products of Sirius Software, Inc., 10364 Rockingham Drive, Sacramento, California 95827, (916) 366-1195. All rights reserved. Apple is a trademark of Apple Computer Inc. Atari is a trademark of Atari Inc. IBM is a trademark of International Business Machines Corp. VIC-20 is a trademark of Commodore Business Machines, Inc. Games of the Century is a trademark of Fox Video Games, Inc.

CIRCLE 311 ON READER SERVICE CARD

To accomplish speed improvements, ALF altered the Applesoft interpreter to force the 8088 to do most of the arithmetic. The more arithmetic you have in your program, the more you will benefit from this card. Most graphics programs contain lots of multiplication and division, two things that the 6502 does very slowly.

You can write 6502 assembly language programs that use the 8088 for arthmetic or block movement. You can also write 8088 programs, though no assembler is provided. The 8088 programs can run simultaneously with 6502 programs. In the future, standard operating systems, like CP/M and MS-DOS should become available for the AD8088.

The AD8088, as hinted above, is the first in a series of ALF boards that will work together to soup up your Apple. The next board will contain up to 128K of RAM, and the third will contain a special graphics processor. The graphics card, priced at $145, should speed up Applesoft graphics commands and provide new graphics facilities. The RAM card will cost $445 with 128K, $370 with 64K, or $295 with no RAM. The card will also accept an Intel 8087 numeric processor which ALF plans to sell for $195. Rumored delivery dates are well before Christmas.

The Fast Floating Point Board by Computer Station

The FFP holds seniority over all the other boards in this review. Computer Station, makers of fine graphic printer drivers and other software, has been selling the product for as long as I can remember. The AMD 9511 does exactly one thing, arithmetic. The advantage of this specialization is that the chip operates very fast, performing thousands of floating point operations per second.

Computer Station provides effective software and simple documentation for interfacing this processing power to Applesoft, Pascal, and Fortran. The whole package costs $475. Among the boards reviewed here, only the FFP board and the Mill include software for Apple Pascal. Like the other processors, the FFP requires a RAM card when used with Applesoft.

Installation creates no hassles. Plug in the card, boot the system, and rename a couple of files. The system works in any slot except zero. When you boot the Apple, a modified Basic interpreter is loaded, so until you reboot, most Basic programs should run faster. After this installation, the configured software can be copied to other disks from which it will automatically install itself.

I tried the FFP with the same programs I used with the AD8088 card. The performance was very similar to the AD8088 for the program containing trignometry and graphics. However, a prime number program was not quite as fast on the FFP as on the AD8088. On the other hand, a program that calculated 1000 square roots ran much better on the FFP. The timings (in seconds) are summarized in Table 2.

Table 2.

	Fplot	Primes	1000 square roots
6502	34	53	51
AD8088	15	23	10
9511	15	29	5

The story behind these results is interesting. The 9511 performs floating point operations faster than the 8088 because there are no built-in floating point instructions on the 8088. To use the 9511 in conjunction with the 6502, however, a numeric conversion must be performed. Dave Hudson of Computer Station found that, in some cases, the numeric conversion takes longer than the time saved by the 9511. His software uses the 9511 only for the most time-consuming functions, not for multiplying and dividing. The ALF software uses the 8088 for all multiplications and divisions as well as the more time-consuming operations.

One big advantage of the FFP is Pascal-Fortran compatibility.

The only big disappointment I found with the FFP came when I used it in conjunction with compilers. Although some programs worked, others did not. I tried both Speedstar and the Hayden compiler, getting similar results from each. The function plotting program is among those which do not run on the FFP when compiled. A smaller complaint is that arithmetic performed by the 9511 is slightly less accurate (6-digit vs. 9-digit) than that done by the 6502 or 8088.

One big advantage of the FFP is Pascal-Fortran compatibility. After installing the Computer Station software unit into your system library, you can use the 9511 for all transcendental functions. The faster sines and cosines of the 9511 should help many graphics and engineering programs.

Coming Soon: A Specialized Processor for Graphics

ALF Products has announced the ADGS graphics subsystem to be used with their AD8088 card for the Apple II. The standard Applesoft HGR, HPLOT, DRAW, and XDRAW functions will operate faster than ever. New capabilities, including additional colors, block drawing, window clipping, and exclusive—or plotting, will be implemented.

Many of the features of today's graphics utility programs have been designed into the hardware of this new card. Color character fonts, 3-D line drawings, color fill, and hi-res scrolling are among the techniques that will now be fast enough to be practical. Furthermore, since these capabilities are implemented on a card, your programming will be much easier than with disk-based utilities.

The ADGS will also have connectors for eight paddles or four joysticks. The analog interface provided will read devices three times faster than the Apple game paddle port does. This means that your programs can respond more accurately to paddle or joystick input when using the ADGS.

The ADGS uses direct memory access techniques to perform these functions without assistance from the Apple 6502. The AD8088 card contains ROM software that controls the ADGS. The speed of the AD8088 in calcualting and moving memory is one of the secrets to the great speed of the ADGS. The combined price of the ADGS and the AD8088 is $490, which includes all necessary software and documentation.

Although I have not tested the ADGS, I think you should know about it before purchasing a new processor card. The ALF reputation for reliable, easy to use products suggests that the ADGS will be a good product to try.

The Choice of

Computer Exchange — The IBM-PC Supply Center

SOFTWARE for the IBM-PC

BUSINESS

	LIST PRICE	OUR PRICE
★ **ASHTON-TATE**, dBase II	$ 700	$359
COMSHARE TARGET, Target Planner Calc	$ 50	$ 39
DENVER SOFTWARE, Easy (Executive Accounting System)	$ 725	$545
HOWARDSOFT, Real Estate Analyzer	$ 250	$189
INFORMATION UNLIMITED, Easywriter II (a WPS)	$ 350	$259
Easyspeller (88K Words)	$ 175	$129
Easyfiler (a DBMS)	$ 400	$299
INNOVATIVE SOFTWARE, T.I.M. III (a DBMS)	$ 495	$369
★ **INSOFT**, Data Design (a powerful easy to use DBMS) NEW!	$ 225	$169
INNOVATIVE, Spell Guard	$ 295	$220
ISM, MatheMagic	$ 90	$ 69
LEXISOFT, Spellbinder (a versatile WPS in CP/M-86)	$ 495	$249
MICRO LAB, The Tax Manager	$ 250	$189
★ **MICROPRO**, WordStar® plus free WordStar Training Manual	$ 495	$249
MailMerge™	$ 250	$149
SpellStar™	$ 250	$149
Special! All Three Above, WordPac	$ 895	$459
WordStar Training Manual	—	$ 25
NORTH AMERICAN BUS. SYSTEM, The Answer	$ 250	$169
PERFECT SOFTWARE, Perfect Writer™	$ 389	$239
Perfect Speller™	$ 189	$119
Perfect Filer ™	$ 289	$179
SELECT INFO., Select (a WPS)	$ 595	$375
SORCIM, SuperCalc	$ 295	$219
SuperWriter, call on availability	$ 395	$295
SUPERSOFT, Disk Doctor (CP/M-86)	$ 100	$ 75
Diagnostics II (CP/M-86)	$ 125	$ 95
Scratch Pad (CP/M-86 and MS-DOS)	$ 295	$225
VISICORP, VisiCalc®/256K	$ 250	$189
VisiDex	$ 250	$199
VisiTrend/Plot	$ 300	$239
VisiFile	$ 300	$199
Desktop Plan	$ 300	$239

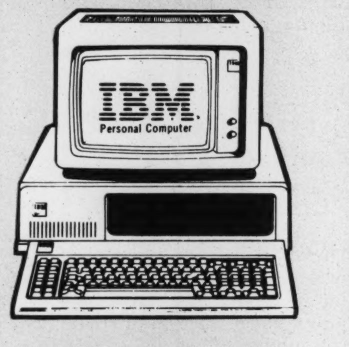
UTILITY

NAGY SYSTEM, Copy/PC, Backup Copier and Utilities	$ 35	$ 29
NORELL DATA, ™ System-Backup, Bit Copier	$ 50	$ 39
NORTON, Norton Utilities, 14 powerful programs, 3 disks	$ 80	$ 65

HOME & EDUCATIONAL

ACORN, Lost Colony	$ 30	$ 24
AUTOMATED SIMULATIONS, Temple of Apshai	$ 40	$ 29
AVALON HILL, Galaxy	$ 25	$ 20
Midway Campaign	$ 21	$ 17
Computer Stocks and Bonds	$ 25	$ 20
Voyager	$ 25	$ 20
Draw Poker	$ 21	$ 17
CONTINENTAL, The Home Accountant Plus	$ 150	$112
DAVIDSON, The Speed Reader	$ 75	$ 55
INFOCOM, Deadline	$ 50	$ 39
Zork I	$ 40	$ 29
Zork II	$ 40	$ 29
ON-LINE SYSTEMS, Frogger	$ 35	$ 26
SIRIUS, Conquest	$ 30	$ 23

Note: We are not an authorized IBM dealer.



HARDWARE for the IBM-PC

	LIST PRICE	OUR PRICE
AST RESEARCH, Combo Plus, 64K with one option. NEW!	$ 495	$379
Combo Plus, 256K with one option. NEW!	$1095	$729
Options: Async. Comm. Port., Para. Printer Port., Clock/Calender Add $80 for second option and $55 for third.		
Parity Memory Card, 64K	$ 395	$279
256K	$ 995	$659
Note: All of above cards are memory upgradeable.		
BYAD INC., DS1, Z80B for CP/M-80	$ 660	$570
DS2, above with serial port, (Sept)	$ 760	$660
CORVUS, Hard Disk System, See Corvus Section This Page.		
CURTIS, PC Pedestal, T.M. for Display on PC	$ 80	$ 65
3 Foot Cable for IBM Mono Display	$ 50	$ 39
DAVONG, DS1-501 Hard Disk, 5 Meg	$1995	$1595
64K RAM Card	$ 299	Call
256K RAM Card	$ 799	Call
★ **MICROSOFT**, 64K RAM Card w/Parity, RAM Drive & Utility	$ 350	$259
128K RAM Card w/Parity, RAM Drive & Utility	$ 525	$395
256K RAM Card w/Parity, RAM Drive & Utility	$ 875	$659
64K RAM Chips T.M.	$ 175	$129
★ **QUADRAM CORPORATION**		
Quadboard, 64K expandable to 256K, 4 function board	$ 595	$449
256K, four function board	$ 995	$689
Microfazer or Interfazer		Call
TG PRODUCTS, Joystick	$ 65	$ 49
Tandon Disk Drives		
TM100-1 Single Sided 160K	$ 280	$229
TM100-2 Double Sided 320K	$ 350	$295
VISTA COMPUTER, 576K Maxicard	$1395	$1195
★ **XEDEX**, Baby Blue, 64K plus CP/M-80 operation	$ 600	$495

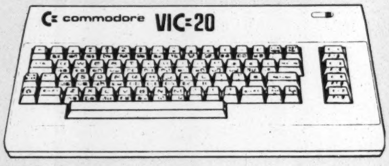
8" CP/M-80 BUSINESS & SYSTEM SOFTWARE

	LIST PRICE	OUR PRICE
ADVENTURE, Adventure's #1 to #12 inclusive, 8"	$ 129	$ 95
★ **ASHION-TATE**, dBase II, 8"	$ 700	$495
COMSHARE TARGET, Target PlannerCalc	$ 50	$ 39
INFOCOM, Deadline, 8"	$ 60	$ 45
Zork I, 8"	$ 50	$ 39
Zork II, 8"	$ 50	$ 39
INNOVATIVE, Spellguard, 8"	$ 295	$220
ISM, MatheMagic	$ 100	$ 75
MICROCRAFT, Legal Billing & Time Keeping	$ 750	$395
Prof. Billing & Time Keeping	$ 750	$395
★ **MICROPRO**, WordStar® plus free WordStar Training Manual	$ 495	$249
MailMerge T.M.	$ 250	$149
SpellStar T.M.	$ 250	$149
Special! All Three Above, WordPac	$ 895	$459
WordStar T.M. Training Manual	—	$ 25
DataStar T.M.	$ 350	$199
SuperSort T.M.	$ 250	$150
CalcStar T.M.	$ 350	$180
Special! All Three Above, DataPac	$ 695	$359
MICROSOFT, Multiplan (uses MSDOS)	$ 275	$199
Fortran-80, 8"	$ 500	$325
BASIC Compiler, 8"	$ 395	$295
COBOL-80, 8"	$ 750	$545
BASIC-80, 8"	$ 350	$275
OASIS, The Word Plus (a WPS)	$ 150	Call
PEACHTREE, Magic Wand, 8"	$ 500	$350
GL, A/R, A/P or Inventory, 8"	$ 750	$495
PERFECT SOFTWARE, Perfect Writer ™	$ 389	$239
Perfect Speller T.M.	$ 189	$119
Perfect Speller T.M.	$ 289	$179
QUALITY, GBS with 3 generators, (a DBMS)	$ 700	$525
SELECT INFO., Select (a WPS)	$ 595	$375
SORCIM, SuperCalc	$ 295	$219
Super Writer, call on availability	$ 395	$295
Spell Guard, call on availability	$ 295	Call
SUPERSOFT, Disk Doctor (CP/M-80)	$ 100	$ 75
Diagnostics II (CP/M-80)	$ 125	$ 95
Scratch Pad (CP/M-80)	$ 295	$225

HEWLETT PACKARD

		LIST PRICE	OUR PRICE
H/P 85A Microcomputer	Limited Special	$2750	$1699
H/P 7225A Professional Flat-bed Plotter	Limited Special	$2750	$1699
H/P 7470A Graphics Plotter	New!	$1550	$1195
H/P 41C Calculator		$ 250	$210
H/P 41CV Calculator with 2.2K Memory		$ 325	$275
H/P 41 Card Reader		$ 215	$179
H/P 41 Optical Wand		$ 125	$105
Wide variety of software and accessories available.			Call

commodore



VIC 20 Home Computer	$300	$229
Datasette VIC 1530	$ 75	$ 59
Disk Drive VIC 1540	$ 600	$479
Super Expander VID 1211A 3K with lots of extras	$ 70	$ 56
3K Memory Expander Cartridge	$ 40	$ 29
8K Memory Expander Cartridge	$ 60	$ 48
16K Memory Expander Cartridge	$ 159	$115
VIC Modem, Telephone Interface	$ 120	$ 96
Joystick	$ 10	$ 8
Game Paddle Pair	$ 20	$ 15

Software full line in stock. Call

PRINTERS, Impact

EPSON. See Epson section below.		
IDS, Prism 132, Color w/Graphics	$1995	$1549
Prism 80, Color, w/Graphics	$1795	$1450
★ Pager Tiger 445C, w/Graphics & 2K Limited Special!	$ 895	$495
Microprism 480, near letter quality	$ 799	$699
NEC, 8023 Printer F/T	$ 695	$495
OKIDATA, Microline 82A, 120 Cps. 80 Col. Para & Serial	$ 649	$495
PAPER, Tractor Feed, Variety in stock, call for price.		

EPSON PRINTERS & ACCESSORIES

MX80 F/T III, with Graftrax+	$ 745	$525
MX100 F/T III, with Graftrax+	$ 995	$695
IBM-PC to Epson Cable	$ 60	$ 45
Apple Interface and Cable for MX80 or MX100	$ 120	$ 95
Grappler+ by Orange Micro, specify your computer	$ 165	$129
Apple Graphics Dump	$ 15	$ 9
Atari to Epson Cable	$ 40	$ 30
TRS-80 to Epson Cable	$ 40	$ 30
Other cables, interfaces, ribbons, heads and paper in stock		Call

PAPER, Tractor Feed, Variety in stock, call for price.

CORVUS SYSTEMS

	LIST PRICE	OUR PRICE
★ **6 Meg Hard Disk**	$2995	$2495
11 Meg Hard Disk	$4795	$3995
20 Meg Hard Disk	$5795	$4795
IBM PC Interface (IBM DOS), Manual & Cable 5'	$ 300	$239
Mirror built-in for easy backup	$ 790	$649
Apple Interface, Manual & Cable 5'	$ 300	$239

Other Interfaces, Omni-Net, Constellation, Mirror. All in Stock.

MONITORS

	LIST PRICE	OUR PRICE
NEC, 12" Green	$ 249	$159
12" Color, Composite	$ 450	$349
SANYO, 9" B&W	$ 190	$149
★ 9" Green	$ 200	$119
12" B&W	$ 250	$199
12" Green	$ 260	$199
13" Color, Composite	$ 470	$349
13" Color RGB	$ 995	$795
Monitor Stand	$ 50	$ 39
ZENITH, 12" Green	$ 150	$119
AMDEK, 12" Green #300	$ 200	$159
13" Color I, Composite	$ 449	$359
13" Color IIA, RGB, Hi Res, (Ap II, III & IBM-PC)	$ 999	$799
13" Color III, RGB, Commercial, (Ap II, III)	$ 569	$469
DVM, Color II or III to Apple II Interface	$ 199	$175

Note: Color II and III come with cable for IBM-PC.

DISKETTES

★Control Data Corporation 12 for 10 Special. Limited Time!

CDC, 120 each, 5¼ with ring, SS, SD (Apple, IBM, etc.)	$ 450	$195
12 each, 5¼, with ring, SS, SD (Apple, IBM, etc.)	$ 40	$ 22
12 each, 5¼ with ring, SS, DD (H/P, IBM 320K, etc.)	$ 51	$ 28
12 each 8", SS, SD	$ 51	$ 28
10 each, 5¼ with ring, DS, DD (IBM)	$ 50	$ 39
IBM, 10 each, 5¼, SS, SD (Apple, IBM, etc.)	$ 60	$ 45
10 each, 5¼, SS, DD (H/P, IBM 320K, etc.)	$ 65	$ 49
VERBATIM, 10 each 5¼, with ring, SS, SD or SS, DD	$ 50	$ 28
MAXELL, 10 each 5¼, SS, SD	$ 55	$ 35
DYSAN, 10 each 5¼, SS, SD	$ 55	$ 39
10 each 5, DS, DD	$ 65	$ 49

Apple, Atari, CP/M, IBM, VisiCalc, WordStar, and Z80 are registered trademarks of Apple Computer, Inc., Warner Communications Co., Digital Research, Inc., International Business Machines Corp., VisiCorp Inc., MicroPro International Corp., and Zilog, Inc. respectively. MicroPro, MailMerge, SpellStar, DataStar, SuperSort and CalcStar are trademarks of MicroPro International Corp. Insoft and Data Design are trademarks of Insoft, Inc. RAMCard, Microsoft, Multiplan and MS are trademarks of Microsoft Corporation. Videx and Videoterm are trademarks of Videx Inc. VisiCorp, VisiDex, VisiTrend/Plot, VisiFile and Desktop Plan are trademarks of VisiCorp, Inc. VIC20 is a trademark of Commodore

AD #942

HOT LINE FOR INFORMATION ON YOUR ORDER
(503) 772-3803

NATIONAL ORDER DESK TOLL FREE (800) 547-1289 ORDERS ONLY
All Other Orders Including Oregon: 772-3256

Portland, OR. Cash & Carry Outlet, 11507-D SW Pacific Hwy., Terrace Shopping Center, Tigard, OR. Over-the-counter sales only. Prices as shown. On 99W between Rte. 217 and Interstate 5. Call 245-1020.

ORDERING INFORMATION AND TERMS: All Mail: P.O. Box 1380, Jacksonville, OR 97530. We ship immediately on Cashier Checks, Money Orders, Fortune 1000 Checks, and Government Checks. Personal Checks and Company Checks allow 20 days to clear. Add 3% for VISA or MC. Add 3% for shipping, insurance and handling (minimum $5). UPS ground is standard. Add 10% more for US Postal, APO or FPO. Include telephone no. No COD. Prices subject to change and typographic errors, so call to verify. All goods are new, include factory warranty, and are guaranteed to work. Due to our low prices all sales are final. Call before returning goods for repair or replacement. ORDER DESK HOURS: 8 to 6 PST, M-F. 10 to 4 Sat. & Sun. 1 p.m. here is 4 p.m. in NY.

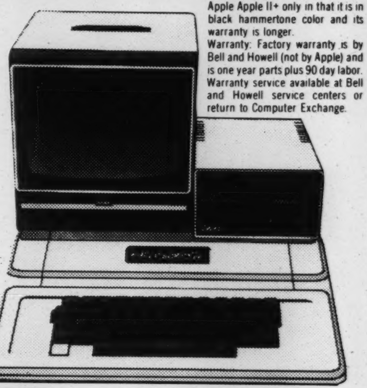
OUR REFERENCES: We have been a computer dealer since 1978 and in mail order since 1980. Banks: First Interstate Bank, (503) 776-5620 and Jefferson State Bank, (503) 773-5333. We belong to the Chamber of Commerce, (503) 772-6293, or call Dun & Bradstreet if you are a subscriber. Computer Exchange is a division of O'Tech Group, Inc.

Professionals

Manufactured Exclusively for **Bell & Howell** by **apple computer**

	LIST PRICE	OUR PRICE	SAVE
B&H Apple II+			
64K (48K + ALS 16K)	$1725	$1195	$530
DISK II w/3.3 Cont.	$645	$520	$125
DISK II Only	$525	$450	$75

OR: SAVE OVER $350 on a pair of drives.
Buy a pair of Micro-Sci A2 Drives.
See opposite page.



The B&H Apple II+ differs from th Apple Apple II+ only in that it is in black hammertone color and its warranty is longer.

Warranty: Factory warranty is by Bell and Howell (not by Apple) and is one year parts plus 90 day labor. Warranty service available at Bell and Howell service centers or return to Computer Exchange.

SPECIAL

B & H APPLE II+
64K STARTER SYSTEM $1.795
SAVE $ 765

- 48K B&H Apple II+
- ALS 16K RAM Card
- Disk II with 3.3 DOS & Controller
- Sanyo 9" Green Monitor

Save $832 total. Substitute a A2 Micro-Sci drive
Add another A2 drive and save a total of $888.

μ-SCI MICRO-SCI

FOR THE APPLE II/II+, III
DIRECT SUBSTITUTES
for APPLE DRIVES

Micro-Sci A2 drives and/or controllers are direct plug compatible substitutes for Apple drives and controllers.

	LIST PRICE	OUR PRICE
● **For Apple II**		
A2, 5¼", 143K Disk Drive	$ 479	$369
Controller Card for A2 Drive	$ 100	$ 79
A40, 5¼", 160K Disk Drive	$ 449	$359
A70, 5¼", 286K Disk Drive	$ 599	$479
Controller for A40 or A70	$ 100	$ 79
Filer, Disk Utility Software	$ 20	$ 15
NEW!		
● **For Apple III** A3, 5¼, 143K Drive	$ 449	$359
A73, 5¼, 286K Drive	$ 649	$529
A143, 5¼, 572K Drive	$ 799	$669

OVERSTOCK SPECIALS FOR APPLE II/II+

VIDEX, Videoterm, 80 column	$ 345	$249
ALS 16K AddRAM Card	$ 149	$ 59
ALS ZCard, Z80 CP/M Card	$ 269	$199
ALS Smarterm 80 Col. Card	$ 345	$245
ALS Synergizer Pack	$ 749	$450

apple® II/II+ supply center

HARDWARE
for Apple II/II+

	LIST PRICE	OUR PRICE
MICRO-SCI, Disk Drives, Plug/software compatible to Apple. See Micro-Sci section.		
RAM CARDS:		
Microsoft, 16K RAM Card	$ 195	$149
★ **ALS**, 16K ADDRam	$ 149	$ 59
Saturn Systems, 32K	$ 249	$169
64K	$ 425	$319
128K	$ 599	$459
★ **Axlon**, 320K RAM Disk system	$1395	$950
80 COLUMN VIDEO CARDS:		
ALS, Smarterm	$ 345	$249
Videx, Videoterm	$ 345	$249
See more **ALS** and **Videx** below.		
Vista, Vision 80	$ 395	$249
M&R, Sup R term	$ 375	$319
MISCELLANEOUS:		
ALS, Smarterm 80 Col. Card Special	$ 345	$249
Z Card (Z-80) W/CPM Special	$ 269	$199
★ 16K ADDRam Special	$ 149	$ 59
★ Synergizer Pack Special	$ 749	$450
Synergizer Pack includes above 3, + CP/M book.		
Note: Above is a limited time offer.		
Apple Computer,		
Silentype II Printer	$ 395	$335
Graphics Tablet	$ 795	$675
Joystick II	$ 50	$ 39
Game Paddle	$ 30	$ 19
Numeric Keypad	$ 150	$119
★ **Axlon**, 320K RAM Disk System	$1395	$950
CCS, Serial Interface 7710A	$ 150	$139
Other CCS Cards in stock	Call	Call
Dan Paymar, Lower Case Chips	$ 50	$ 39
Hayes, Micromodem II	$ 379	$289
Smartmodem	$ 279	$229
Kensington, System Saver	$ 90	$ 69
★ **Keyboard Company**,		
Joystick II	$ 50	$ 39
Game Paddle	$ 30	$ 23
Numeric Keypad	$ 150	$119
M&R, RF Modulator	$ 30	$ 25
Sup R fan	$ 50	$ 39
★ **Microsoft**, Z80 Softcard	$ 399	$269
16K RAM Card	$ 195	$149
Softcard Premium Pack	$ 775	$579
Mountain,		
CPS Multifunction Card	$ 239	$209
★ Clock/Calendar	$ 280	$245
Novation, Applecat Modem	$ 389	$329
Orange Micro, Grappler	$ 165	$119
★ **Practical Peripherals**, w/cable & Conn.)		
MBS 8K Serial (Epson)	$ 159	$129
MBP 16K Para (Epson)	$ 159	$129
★ Microbuffer II 16K, (printer ??)	$ 259	$209
Microbuffer II 32K, (printer ??)	$ 299	$229
RH Electronics, Super Fan II	$ 75	$ 59
SSM, AIO-II, Serial/Para. Interface	$ 225	$169
TG Products: Game Paddles	$ 40	$ 29
Joystick	$ 60	$ 45
Select-A-Port	$ 60	$ 45
★ **Videx**, Videoterm 80 col.	$ 345	$249
Soft Video Switch	$ 35	$ 25
Enchancer II	$ 149	$ 99
Enchancer (Rev. 6)	$ 129	$ 99
Function Strip	$ 79	$ 59
Applewriter II preboot disk	$ 20	$ 15
Visicalc to 64K preboot disk	$ 50	$ 39
Visicalc to 176K preboot disk	$ 90	$ 69
Full Videx Line. Call, up to 35% off.		

SOFTWARE
on disk for Apple II/II+
OUR BEST SELLERS — CALL ON OTHERS

BUSINESS

	LIST PRICE	OUR PRICE
Apple Computer, Inc.		
The Controller (Accounting)	$ 625	$499
Apple Writer II	$ 150	$119
Apple Pascal	$ 250	$199
Apple Fortran	$ 200	$159
DOS Tool Kit	$ 75	$ 59
DOS 3.3 Upgrade Kit	$ 75	$ 59
Apple Pilot	$ 150	$119
DJ Portfolio Evaluator	$ 50	$ 45
How to!	$ 50	$ 39
Microcourier	$ 250	$199
Micro Telegram	$ 250	$199
Time Manager	$ 150	$119
Apple Logo	$ 175	$139
Applied Soft Tech., Versa Form	$ 389	$289
Artsci, Magic Window II	$ 150	$115
Ashion-tate, dBase II (CP/M)	$ 700	$459
Beagle Bros., Utility City	$ 30	$ 22
DOSS Boss	$ 24	$ 18
Borderbund, G/L with A/P	$ 495	$369
A/R (call on avail.)	$ 495	$369
Payroll	$ 395	$295
Continental, GL, AR, AP or PR, ea.	$ 250	$189
1st Class Mail	$ 75	$ 59
Home Accountant	$ 75	$ 56
dBase II for Apple II/II+ CP/M	$ 700	$459
Hayden, Pie Writer (Specify brd.)	$ 170	$115
High Tech., Store Mgr.	$ 250	$189
★ Job Control Sys.	$ 750	$350
Info Master	$ 189	$119
Howard Soft,		
Creative Financing	$ 195	$145
Real Estate Analyzer II	$ 195	$145
Tax Preparer	$ 150	$115
Info. Unlim., Easywriter (PRO)	$ 175	$129
★ **Innovative**, Spellguard (CP/M)	$ 295	$150
Lexisoft, Spellbinder (a WPS)	$ 495	$269
★ **Micro Craft**,		
(CP/M) Professional Billkeeper	$ 750	$395
Legal Billing & Timekeeping	$ 750	$395
Micro Lab, Data Factory ver 5.0	$ 300	$249
Visifactory	$ 75	$ 56
Invoice Factory	$ 200	$129
Tax Manager	$ 150	$ 99
Micro Pro, (all CP/M)		
★ WordStar® + Training Manual	$ 375	$199
MailMerge™	$ 125	$ 69
SpellStar™	$ 200	$119
SPECIAL! All 3 above	$ 700	$350
Data Star™	$ 295	$169
CalcStar ™	$ 195	$119
SuperSort ™	$ 200	$119
SPECIAL! All 3 above	$ 690	$345
WordStar® Training Manual	—	$ 25
Muse, Super Text II	$ 150	$113
Super Text 40/80	$ 175	$129
Super Text 40/56/70 New!	$ 125	$ 95
Form Letter	$ 100	$ 75
On-Line, Expediter II Compiler	$ 100	$ 69
ScreenWriter II	$ 130	$ 95
General Manager	$ 150	$115
Osborne/C.P. Soft., (Disk and Book)		
★ Some Common Basic Programs. 75 Business, Statistics and Math programs for the Apple II	$ 100	$ 49
★ Practical Basic Programs. 40 more very valuable programs beyond "Some Com. Basic Prog"	$ 100	$ 49
Peachtree, GL, AR, AP, INV. or PR	$ 400	$189
★ Magic Wand (Specify board)	$ 500	$250
Perfect, Perfect Writer	$ 389	$239
Perfect Speller	$ 189	$119
Perfect Filer	$ 289	$179
Sensible, Sensible Speller	$ 125	$ 95
Silcon Valley, Word Handler	$ 250	$139
Sof/Sys, Executive Secretary	$ 250	$189
Executive Speller	$ 75	$ 55
★ **Solldus/Softech**		
Stockfile	$ 600	$350
Stockseller	$ 700	$450
Software Publishing,		
PFS II	$ 125	$ 95
Graph	$ 125	$ 95
Sorcim, SuperCalc, (CP/M)	$ 295	$219
Southeastern,		
Data Capture 4.0, specify brd.	$ 90	$ 69
SSM, Transcend,		
(Call on others) New!	$ 89	$ 69
Stoneware, DB Master	$ 229	$179
DB Utility I or II	$ 99	$ 75
Systems Plus,		
Acctg. Plus, General Ledger	$ 425	$295
Acctg. Plus, GL, AP and A/R	$ 995	$595
Acctg. Plus, above + Inventory	$1395	$775
VisiCorp/Personal Software,		
Visicalc 3.3	$ 250	$189
VisiDex Special!	$ 250	$175
VisiFile	$ 250	$199
Desktop Plan II	$ 250	$199
Desktop Plan III	$ 300	$219
Visiplot	$ 200	$159
VisiSchedule New!	$ 300	$239
VisiTrend & VisiPlot Special!	$ 300	$210
VisiTerm	$ 100	$ 79

UTILITY & DEVELOPMENT

Beagle, Utility City	$ 30	$ 22
DOS Boss	$ 24	$ 18
Central Point Software:		
Filer, DOS Utility	$ 25	$ 18
★ Copy II Plus (bit copier)	$ 40	$ 35
Comp. Appl., Nibbles Away II	$ 70	$ 59
Epson, Graphics Dump	$ 15	$ 9
Insoft,		
GraFORTH by Paul Lutus	$ 75	$ 59
ALD System II by Paul Lutus	$ 75	$ 59
TransFORTH II by Paul Lutus	$ 125	$ 99
Electric Duet by Paul Lutus	$ 30	$ 25
Microsoft,		
A.L.D.S.	$ 125	$ 75
BASIC Compiler	$ 395	$299
Cobol 80	$ 750	$559
Fortran 80	$ 195	$149
Olympic Decathlon	$ 30	$ 24
TASC Compiler	$ 175	$159
★ **Omega**, Locksmith (bit copier)	$ 100	$ 75
On-Line, Expediter II, Compiler	$ 100	$ 69
LISA 2.5	$ 80	$ 60
Penguin, Comp. Graphics Sys. New!	$ 70	$ 53
Phoenix, Zoom Grafix	$ 40	$ 29
Quality, Bag of Tricks New!	$ 40	$ 29
Southwestern, ASCH Express	$ 80	$ 59
Sensible, Back It Up, (bit coper)	$ 60	$ 49

HOME & EDUCATION

Broderbund,		
Apple Panic	$ 30	$ 21
Arcade Machine (call first)	$ 45	$ 32
Star Blazer	$ 32	$ 24
Choplifter New!	$ 35	$ 26
Many others		Call
Budgeco, Raster Blaster	$ 29	$ 22
Continental, Home Accountant	$ 75	$ 56
Edu-Ware, Several in stock	Call	Call
Hayden, Sargon II (Chess)	$ 35	$ 29
Infocom, Deadline	$ 50	$ 38
Zork I or II	$ 40	$ 29
Insoft, Electric Duet by Lutus	$ 30	$ 25
GraFORTH by Lutus	$ 75	$ 59
Zargs New!	$ 35	$ 27
Spider Raid New!	$ 30	$ 24
Lightning, Mastertype	$ 40	$ 29
Microsoft, Olympic Decathlon	$ 30	$ 24
Typing Tutor II	$ 25	$ 19
Muse, Robot War	$ 40	$ 29
Castle Wolfenstein	$ 30	$ 23
On-Line,		
Ultima II	$ 55	$ 40
Threshold	$ 40	$ 30
Cranston Manor	$ 35	$ 26
Mystery House	$ 25	$ 19
Softporn (X Rated)	$ 30	$ 22
Ulysses & Golden Fleece	$ 40	$ 22
Cannonball Blitz. New!	$ 35	$ 26
Sentient, Oo-TOPOS	$ 33	$ 25
Sirius, Gorgon	$ 40	$ 29
Twerps	$ 30	$ 22
Sir-Tec, Wizardry	$ 50	$ 39
Knight of Diamonds. New!	$ 35	$ 26
Sub Logic, Flight Simulator	$ 34	$ 28
Pinball	$ 30	$ 23
Strategic, Southern Command	$ 60	$ 30

OTHER BRANDS IN STOCK. CALL.

ATARI®

800 Computer 16K	$ 899	$665
800 Computer 48K	$1099	$777
810 Disk Drive	$ 600	$444
850 Interface	$ 220	$169
410 Recorder	$ 100	$ 79
16K RAM	$ 100	$ 85
32K RAM	$ 200	$109

Call for other software and accesories.

NEC

8001 32K Computer	$ 995	$739
286K Total, Dual Drive PC8031	$ 995	$739
32K addon and I/O Unit PC8012	$ 649	$485

Call for other software and accesories.

THE WORLD'S LARGEST COMPUTER MAIL ORDER FIRM

Computer Exchange™

AD #942

A Division of
O'TECH Group Inc

ALL MAIL: P.O. Box 1380, Jacksonville, OR 97530
WAREHOUSE AND OFFICES BY APPOINTMENT AT 6791 UPPER APPLEGATE ROAD.
CIRCLE 147 ON READER SERVICE CARD

★ Means a BEST buy.

Dtack Grounded 68000 Board by Digital Acoustics

The revenge of Motorola comes in the form of the most powerful single-chip CPU available today. The folks at the microprocessor division were sickened by the enormous success of MOS Technology's 6502, which was invented by ex-employees of Motorola. The 68000, with a 16-bit data bus, 24-bit address bus, and many 32-bit registers, is in many ways more powerful than most of the computers made by DEC and Data General. This microprocessor can address 16 megabytes of memory, without bank switching, segment selecting, or other software bookkeeping.

The Dtack Grounded board does not fit inside the Apple II. Instead, it must lie outside your computer, connected to it via a ribbon cable and small interface card, both of which are supplied. Also in the package you will find a disk and several documents. The disk contains an Applesoft interface and an impressive 3-D graphics demonstration. The price for all this varies according to how much RAM you want on the board. The 12K version costs $627, and the maximum RAM board, 92K, goes for $947.

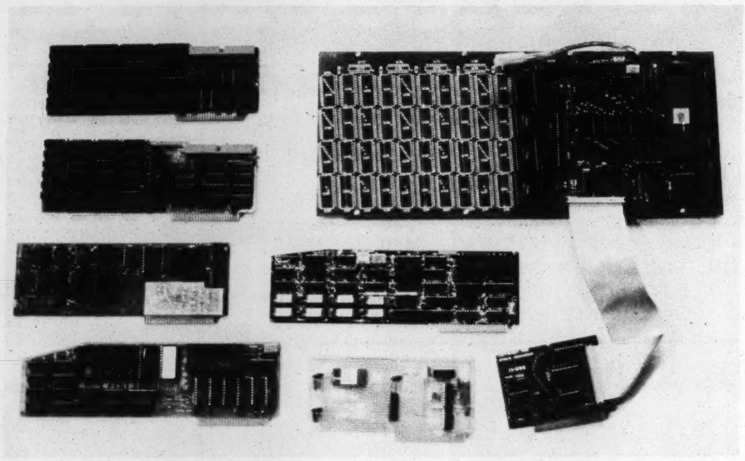
The software for Applesoft speedup is not quite as simple to use as that provided by ALF and Computer Station for their boards. Besides booting a modified DOS, you must add a two-statement prefix to each Basic program. That prefix loads and activates a link to the Dtack board. I found no other problems with the system.

Theoretically, the Dtack board should be much faster than the 8088s, 9511 or the 6502. Timing (in seconds) for the Fplot program is shown in Table 3.

Table 3.

	Without 68000	With 68000
Basic	34	13
Compiled	26	5

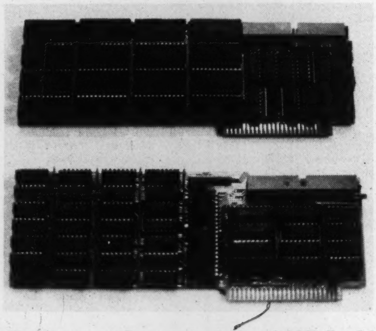
You can see only a modest advantage for the 68000 compared to the AD8088. Assembly language programmers should be able to squeeze out greater benefits. The supplied software makes the 68000 perform only the arithmetic parts of each program. By recoding graphics and other parts into 68000 assembler, you can achieve more dramatic results. The Dtack demonstration software shows detailed 3-D images being generated in motion in real time. All observers were impressed. However, nobody volunteered to duplicate the feat.



Processors on Parade. The magnificent specimen in the upper right is the Dtack Grounded 65000 board, which is approximately the same size as the Apple II motherboard. Attached to the Dtack is the interface card that ties it to the Apple bus. Proceeding clockwise, we see the FFP from Computer Station, the AD8088 from ALF, the Mill from Stellation Two, the Booster CPU, and the Booster 32K RAM card, both from Number Nine. Smack in the middle, we find the 88 card from Coprocessors.

The Booster System by Number Nine Computer Engineering

Last but not least in our survey comes a board that does not have a revolutionary new processor. Instead, it has a souped up 6502. The CPU in this system is the 6502C, which can run much faster than the CPU in the Apple and run *All* the same software. To take advantage of the faster CPU, you must also buy a special RAM board from Number Nine. A very fast 32K static RAM board costs $625; the processor board sells for $350.



The Booster System includes a 32K RAM card (top) a 3.6 MHz CPU (below) and a 128K RAM card (not shown).

The booster boasts the easiest software installation of all the boards tested. Absolutely no alteration to software is required. Consequently, all games, languages, and applications, even copy-protected programs like Visicalc, can take advantage of the high-performance hardware.

The hardware part of the installation is not so easy. The CPU and RAM boards communicate with each other via a ribbon cable. Because these boards can provide many functions beyond merely speeding up an Apple, there are many jumper switches on them. Figuring out how to set the jumpers can be difficult.

The manuals that come with the boards contain straight reference material suitable for engineers. Most ordinary people buying these boards will have to go through some trial and error, and may have to call the manufacturer for advice.

Number Nine also makes a 128K dynamic memory board which, theoretically, could make performance a teeny bit faster when used in addition to the 32K board and CPU. Using the 128K board without the 32K board should work out a bit slower. The bigger board costs $625. I tested a system with 32K of Booster memory, since it seemed to be the most cost-effective configuration.

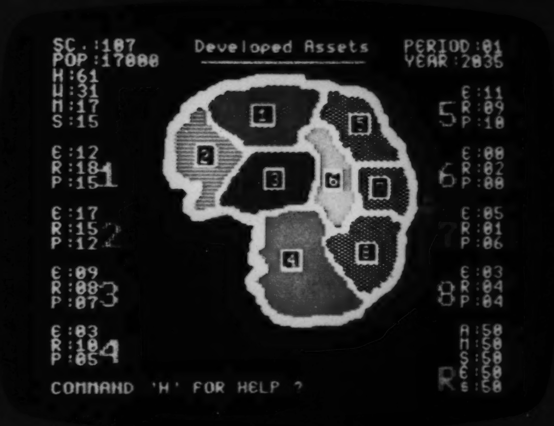
My timing tests showed that this is the fastest CPU when running interpreted Applesoft Basic. It also acquitted itself very well with the compiled FPLOT and prime number programs. The timings (in seconds) are shown in Table 4.

Suspecting that the 6502C and

Arcade Gamers...

Expand your horizons.

Our fabulous New Wave Strategy line by Terry Eagan represents a new concept in strategy gaming.


SC.:107
POP:17000
H:61
W:31
M:17
S:15
€:12
R:18
P:15
1
€:17
R:15
P:12
2
€:09
R:08
P:07
3
€:03
R:10
P:05
4
Developed Assets
1
2
3
4
5
6
7
8
PERIOD:01
YEAR:2035
5
€:11
R:09
P:10
6
€:00
R:02
P:00
7
€:05
R:01
P:06
8
€:03
R:04
P:04
R
A:50
M:50
S:50
€:50
$:50
COMMAND 'H' FOR HELP ?

ZENDAR is an involved economic-defense simulation. Simple to play yet intrinsically complex, its underlying model may require years of strategy optimization. ZENDAR may take some slightly longer than one hour to play, but potential empire builders will find it positively captivating. (**Pure Strategy**)

FRONTLINE is a battle of wits and strategy. You dispatch troops to defend your front line and break through an enemy sector. This game requires quick offensive and defensive tactical maneuvering. (**Arcade-Strategy**)

ROADBLOCK is a chase game with the realism you've come to expect from SubLOGIC. Dispatch your police cars to prevent bank robbers from escaping in their Porsche 924. (**Arcade-Strategy**)

Learn in 5 minutes, play in 1 hour.

48K Apple II disk, $29.95.

See your dealer...

or for direct orders, add $1.50 and specify UPS or first class mail.
Illinois residents add 5% sales tax. Visa and MasterCard accepted.

"Apple" is the registered trademark of Apple Computer Inc.

subLOGIC
Communications Corp.
713 Edgebrook Drive
Champaign, IL 61820
(217) 359-8482
Telex: 206995

CIRCLE 295 ON READER SERVICE CARD

sinclair 1000

NEVER BEFORE HAS THE POWER OF THE COMPUTER BEEN WITHIN REACH OF SO MANY.

TIMEX INTRODUCES THE $99.95* COMPUTER.

TIMEX sinclair 1000

This new computer from Timex represents a major breakthrough: a real computer at an almost unreal price. How is this possible? As technology increases, price decreases. It happened to the calculator. It happened to the digital watch. Now Timex has made it happen to the computer. It's our advances in circuitry and microchip technology that made it possible. We've taken the conventional computer and reduced it onto four extremely powerful chips... including our Master Chip which replaces as many as 18 conventional microchips.

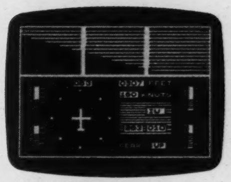
TIMEX User Manual
TIMEX sinclair 1000

THE COMPUTER DE-MYSTIFIED

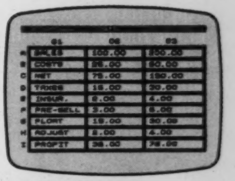
With the Timex Sinclair 1000™, you also get a step-by-step learning guide that we took as much care in designing as we did our computer. With our guide, you can start running programs within an hour. Within weeks you'll be writing your own. Each step you take makes the next step easier. By the time you're through you will have mastered BASIC programming. BASIC is the computer language most widely used today.

EVERYTHING YOU NEED TO BEGIN

The Timex Sinclair 1000 allows you to use your own television set as a display monitor, and your audio cassette recorder to retrieve and enter stored programs. Everything else you need to join the world of computer technology is included: the Timex Sinclair 1000 computer; all necessary TV and audio cassette recorder connectors; plus the Timex Sinclair 1000 easy-to-read learning guide that allows you to begin working with the computer immediately.

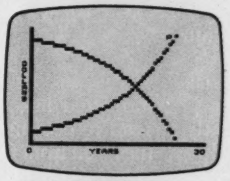


EDUCATION

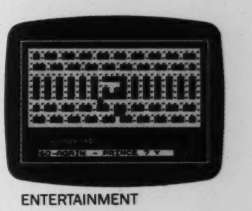


	01	02	03
A	SALES	100.00	200.00
B	COSTS	25.00	50.00
C	NET	75.00	150.00
D	TAXES	15.00	30.00
E	INSUR.	2.00	4.00
F	PRE-SELL	3.00	6.00
G	FLOAT	15.00	30.00
H	ADJUST	2.00	4.00
I	PROFIT	38.00	76.00

BUSINESS



HOME FINANCE



ENTERTAINMENT

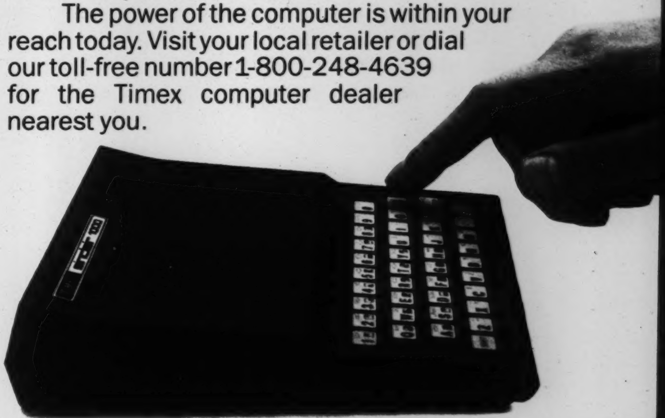
AS YOUR SKILL EXPANDS SO DOES OUR SYSTEM

As you progress further into computer technology our computer system is designed to keep up with you. Pre-programmed cassettes are available on subjects such as education, business and entertainment.

You can also expand the capacity of the Timex Sinclair 1000 for an additional $49.95* by adding the 16K RAM memory bank. This helpful option lets you do further advanced programs as well as more ingenious graphic displays.

Within the near future a hard copy printer will be available as well as a telephone modem, a simple device that will allow you to link up to other computer data banks.

The power of the computer is within your reach today. Visit your local retailer or dial our toll-free number 1-800-248-4639 for the Timex computer dealer nearest you.



TIMEX COMPUTERS

THE POWER IS WITHIN YOUR REACH

*Suggested retail price.

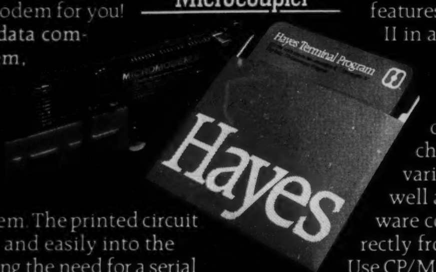
© Timex Computer Corporation, 1982

CIRCLE 368 ON READER SERVICE CARD

More Apple II owners choose Hayes Micromodem II than any other modem in the world. Compare our features. Thousands of Apple II owners have compared, considered, and are communicating now — with Micromodem II. And the modem most popular with Apple II users will be the best selling modem for you!

A complete data communication system. Micromodem II is not "base priced" plus necessary "options." It's a complete, high-performance system. The printed circuit board fits quickly and easily into the Apple II, eliminating the need for a serial interface card. And the Microcoupler™ (included) connects the Apple II directly to a standard modular telephone jack, preventing the distortion of acoustic couplers. Auto-dial and answer features are built in. Operation can be full or half duplex, with a transmission rate of 300 bps. And it's Bell 103 compatible and FCC approved.

Now there's Hayes Terminal Program, too! Our new Terminal Program makes Micromodem II easier than ever to demonstrate — and sell! Now you and your customers can access all the great features of Micromodem II in a matter of seconds. Because Hayes Terminal Program is menu driven, you can choose from a wide variety of options, as well as change hardware configuration, directly from the keyboard. Use CP/M,® DOS 3.3 or Pascal formatted diskettes to create, send, receive, list and delete files — all from the same terminal program disk. The Terminal Program opens up a whole world of convenience for your customers. They can generate ASCII characters not normally available from Apple keyboards. And they can use the Terminal Program with several popular printers (serial or parallel) to get hardcopy during data transmission.



Software sold with Micromodem II or separately. At Hayes, we've packed a lot of performance into a very competitive price. That's a definite plus for you, whether you're selling the package, or ringing up add-on sales to current Micromodem II owners.

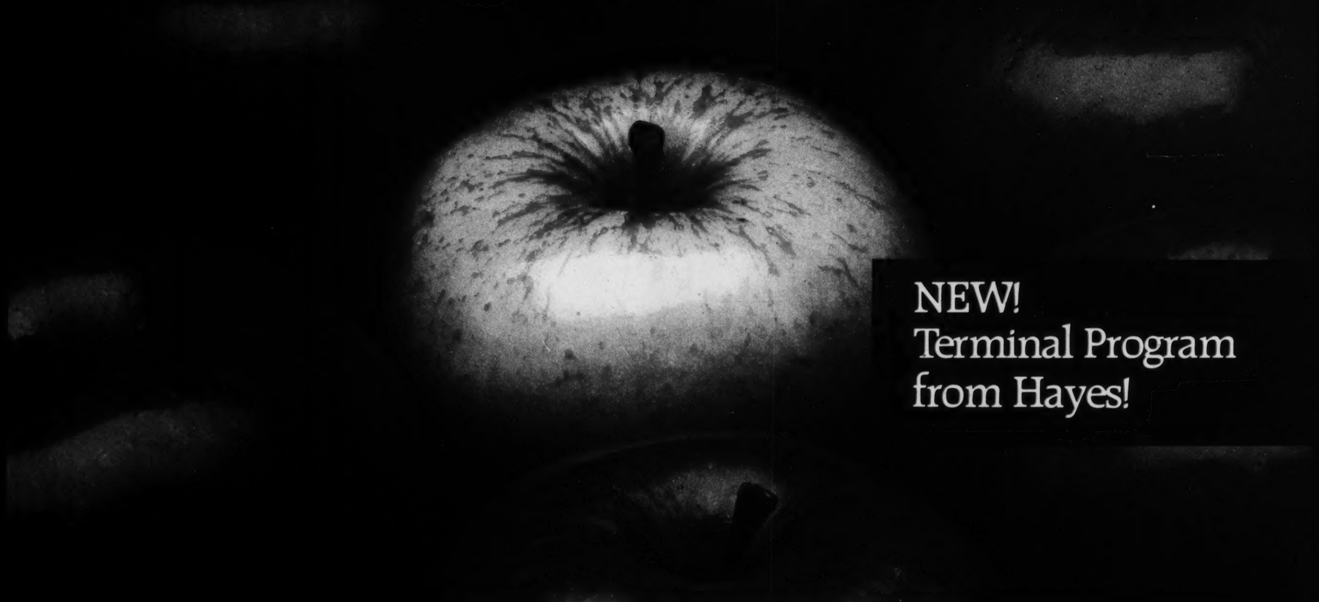
If your customers are ready to communicate, they're ready for Micromodem II. And we're ready for you, with factory-tested dependability, prompt delivery, and national advertising and sales support. Plus the new Hayes Terminal Program, the perfect complement to the world's best-selling modem for Apple II.

Hayes

So compare. Consider. And communicate. Call us today to become a Hayes dealer.

Hayes Microcomputer Products, Inc.
5835 Peachtree Corners East
Norcross, Georgia 30092 (404) 449-8791

The Apple® II
just isn't the same without
Hayes Micromodem II.™



NEW!
Terminal Program
from Hayes!

™Micromodem II and Microcoupler are trademarks of Hayes Microcomputer Products, Inc. Apple is a registered trademark of Apple Computer, Inc. CP/M is a registered trademark of Digital Research, Inc. © 1982 Hayes Microcomputer Products, Inc. Sold only in the U.S.A.

CIRCLE 204 ON READER SERVICE CARD

68000, as implemented on the above boards, might complement each other, I tried both of them together. Not surprisingly, the combination yielded the best times of all. With this combination, programs ran from 5.7 to 23.3 times faster than they did on the plain 6502, at a total added cost of $1602. The timings (in seconds) can be found in Table 5.

Table 4.

	Without Booster	With Booster
Basic	34	10
Compiled	26	8

Table 5.

	Standard 6502	With Booster and 68000
Basic	34	6
Compiled	26	4

Performance Comparison

Table 6 contains a summary of all of the tests I performed. The only blemish results from the fact that Fplot would not run with the 9511 after compiling. The "Combo" line shows the results of using the 6502C together with the 68000.

The only clear winner is the 6502C/68000 combination. The 6502C excelled mainly when running interpreted Basic. The 68000 impresses most at running compiled programs. Don't forget that the 6502C can speed up programs in any Apple compatible language; the other boards are more limited.

The 8088 and 9511 ran neck-and-neck in these tests, but the 8088 seems to have an advantage since it is a more general processor. The ALF 8088 card also calculates numbers with greater accuracy than the 9511 (9-digit vs. 6-digit precision.) You can expect additional language and operating system support for the AD8088.

The compiled programs were produced with the Speedstar compiler from Southwestern Data Systems. The Primes program calculates and prints all the prime numbers between 0 and 1000. The Fplot program calculates many sines and cosines and plots hundreds of points. The roots program calculates 1000 square roots and prints status messages as it runs. These tests indicate not the full potential of the cards, but the power available to an ordinary Basic programmer.

Summary

Each of the products completely fulfilled the promises made for it. I have described six different cards for three different kinds of users. The ALF, Computer Station, Number Nine, and Dtack Grounded cards give improved performance to most existing Applesoft applications. The Stellation card provides an exciting new programming environment. The Coprocessors card prepares you for a new generation of business applications.

Manufacturers Of Add-on Processors For Apple II

ALF Products
1448 Estes
Denver, CO 80215

Computer Station
11610 Page Service Dr.
St. Louis, MO 63141

Coprocessors, Inc.
50 West Brokaw Rd., Suite 64
San Jose, CA 95110

Digital Acoustics—Dtack Grounded
1451 E. McFadden, Suite F
Santa Ana, CA 92705

Number 9 Computer Engineering
P.O. Box 1802
Hartford, CT 06144

Stellation Two
P.O. Box 2342
Santa Barbara, CA 93120 □

Table 6.

	Interpreted			Compiled		
	Primes	Fplot	Roots	Primes	Fplot	Roots
6502	53	34	51	43	26	49
9511	29	15	5	24	**	9
8088	23	15	10	15	7	8
6502C	15	10	15	12	8	14
68000	20	13	5	12	5	3
Combo	8	6	2.8	6	4	2.1

Table 7.

Manufacturer	Model	Processor	Emphasis	Price	Pascal/ Fortran?
ALF	AD8088	8088	Performance	345	No
Computer Station	FFP	9511	Performance	495	Yes
Coprocessors	88Card	8088	Features	899	*
Dtack Grounded	68000 w/12K	68000	Performance	643	**
Number Nine Engineering	Booster CPU+ 32K RAM	6502C	Performance	975	Yes
Stellation Two	OS/9 Mill	6809	Features	495	Option

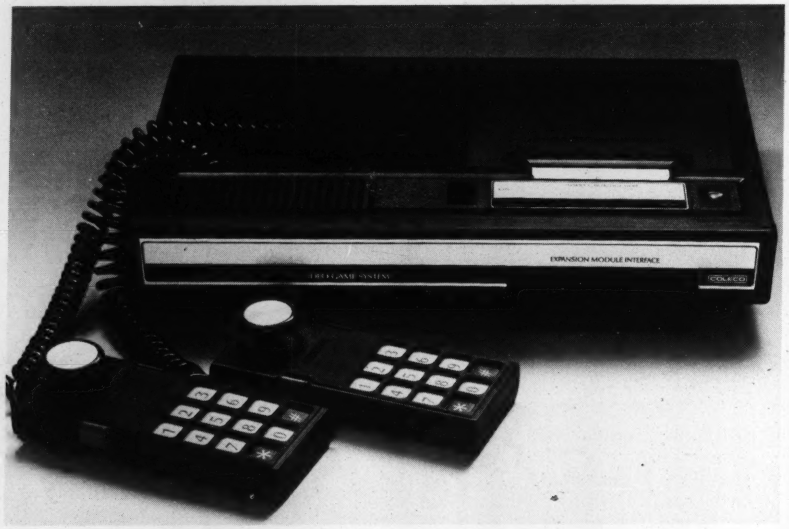
*CP/M-86 can support many languages from various vendors, but not Apple Pascal.

**Pascal support for the Dtack board is available from other suppliers.

Colecovision

creative
computing
equipment
evaluation

New Kid On The Block



Owen Linzmayer

Ever since its introduction five years ago, the Atari Video Computer System (VCS) has been the most popular home arcade game machine. Several manufacturers have tried to topple Atari from the top of the ladder. To date, none has succeeded. Most of these companies lacked one or more of the following: a better product, a large advertising campaign, a well known brand name, or continued product support. Enter Colecovision.

Colecovision is the newest and most promising contender for the home arcade game crown. Not only does Colecovision have respectable origins, it is backed by a tremendous radio and television advertising campaign. In my opinion, Colecovision is a much better product than the Atari VCS, and if the cartridges currently available are any indication, Coleco seems to have devoted considerable thought to user support.

The System

The basic Colecovision package has no manufacturer suggested retail price. Prices in the stores range from as low as $160 to upward of $200. The basic system consists of a console unit, two hand-held controllers, a power supply, a complimentary *Donkey Kong* game cartridge, an antenna switch box, and a video cable. Everything you need to play, except a working color television set, is included in the Colecovision package.

The Console Unit

The main console unit is composed of sturdy black plastic with a grainy finish. It has a low-profile, sleek design and measures only 15" x 9.5" x 5" with a game cartridge inserted.

The sliding on/off switch is clearly marked and located to the left of the cartridge slot. Although the words ON and OFF are printed directly to the side of it, due to the nature of a sliding switch, it is not very clear whether the unit is on or off. For some reason, Coleco, like most other home game manufacturers, neglected to include a small LED on/off indicator. This would have been useful, particularly for young players.

Directly to the right of the power switch is the RESET button. This button is flush with the surface of the console, making it difficult to hit accidentally. Pressing the RESET button at any time causes the unit to end the current game, and returns you to the banner screen. Incidentally, every time the system is reset or powered-up, you must wait for 12 seconds before you can choose a new difficulty level and begin again. This is one of the most annoying waits I have ever encountered in a game.

Located on the righthand side on the front of the console is the interface port. Three expansion modules that can be plugged into this port—one at a time—have been announced. Covering this opening is a flimsy little door that slides up to allow access to the exposed edge connector.

At the time of the initial release of Colecovision, there were no expansion modules available. I spoke with Coleco representatives who said that there should be two expansion modules on the market by the time you read this. The first module, with an estimated retail price of $60, will allow any cartridge that runs on the Atari VCS system to be run on the Colecovision. In other words, owners of Atari VCS systems can buy new Colecovisions and continue to use their old cartridges—a very clever marketing ploy.

The second expansion module is a driving controller. It consists of a large steering wheel, a numeric keypad, and a pressure-activated footpad that acts as the accelerator. The only cartridge currently available that makes use of this module is *Turbo*. Arcade fanatics know Turbo as *the* racing game from Sega/Gremlin. Coleco has plans for other flying and driving games that will make use of this module.

Coleco also has plans for a keyboard module which will turn the ColecoVision game unit into a computer. A release date for this unit has not been announced.

When properly inserted in its slot, the cartridge protrudes about 2" from the console. The game cartridges and the slot are designed to make it impossible to insert a cartridge incorrectly. The advan-

CP/M® IBM® APPLE® PRICE WAR!

WordStar® **$249**	**dBASE II™** **$489**	**SuperCalc™** **$189**	**Perfect Writer™** **$249**	**VisiCalc®** **$189**
WordStar® dBASE II™ **$695**	**WordStar®/ MailMerge™** **$309**	**EasyWriter II™** **$269**	**TCS Accounting™** **$289**	**SuperWriter™** **$249**

NOW, PAY LESS, AND GET GREAT SERVICE, TOO!

If you're looking for rock-bottom prices *and* fast, personal service, take a close look at 800-SOFTWARE.

Because we buy in volume, we're able to sell the products you want at prices that finally make some sense. But don't take our word for it. Compare prices and see for yourself!

OUR SERVICE CAN'T BE BEAT.

We take care of you like our business depends on it. Because it does.

When you call 800-SOFTWARE, you get the fastest delivery available anywhere. Which means that every order is filled the day we get it. And that our unique Order Tracking System™ is on the job, keeping tabs on your order, every step of the way.

Our giant inventory—one of the largest in the United States—also assures you of the fastest possible service. Everything's in stock so you don't have to wait.

Technical support? Business software expertise? We've got it—and it's the best you'll find *anywhere*.

But, put us to the test. Let us prove what we've proven to satisfied customers around the world.

That our prices *are* lower. That our service *is* better. That there really and truly *is* a difference.

We look forward to your call.

CUSTOMERS TELL OUR STORY BEST!

"I have been very favorably impressed with your prompt and efficient service and excellent prices."

Peter Sereny, M.D., West Hartford, Connecticut

"Rarely today do I have the opportunity to deal with a firm which shows such a high degree of professional ability. Aloha."

Joe Neil, Lihue, Hawaii

"It is indeed refreshing to deal with people as personable and professional as you have proven to be."

Dave Turner, U.S.N., Lubbock, Texas

"Thank you very much for the very prompt service you gave me."

William Drescher, Lansing, Michigan

All letters on file.

TO ORDER, CALL TOLL-FREE:
800-227-4587
In California, 800-622-0678
CA residents add sales tax.

OR WRITE: 800-SOFTWARE, INC.
185 Berry Street, Suite 6820
San Francisco, CA 94107

- ☐ Purchase orders accepted
- ☐ Prompt UPS 3 day Blue Label service
- ☐ Call for shipping charges and our other low software prices.
- ☐ Now open Monday through Saturday.

800-SOFTWARE

FREE GIFT!
GET 4 FLOPPY DISKETTES FREE WITH ANY PURCHASE, IF YOU ACT NOW!

- ☐ Your choice of 5¼" or 8"
- ☐ Brand new and brand name

VISA MasterCard AMERICAN EXPRESS

CIRCLE 185 ON READER SERVICE CARD

© Copyright 800-Software, Inc. 1982

Krell's College Board
SAT*
Preparation Series

A COMPREHENSIVE PREPARATION
PACKAGE / 30 PROGRAMS / $299.95

1. Diagnostic analysis
2. Prescription of individual study plans
3. Coverage of all SAT* skills
4. Unlimited drill and practice
5. SAT* Exam Question simulator
6. All questions in SAT* format and at SAT* difficulty level
7. Instantaneous answers, explanations and scoring for problems
8. Worksheet generation and performance monitoring - (optional)
9. A complete record management system- (optional)
10. Systematic instruction in pertinent math, verbal & test taking skills - (optional)

Krell's unique logical design provides personalized instruction for each student according to individual needs.

APPLE. ATARI. COMMODORE. CBM/PET. CP/M. I.B.M.. RADIO SHACK TRS-80.

LOGO $99
NO FRILLS PAK

1. Two copies of Krells LOGO for Apple II*
2. Utility Disk with M.I.T.'s valuable demo programs including Dynatrack
3. The official M.I.T technical manual LOGO FOR APPLE II by H. Abelson & L. Klotz

No Frills Turtle Price $99.00

FRILLS FOR LOGO
FRILLS FOR LOGO / Support Pak for M.I.T. LOGO. KRELL & TERRAPIN INC

1. Krell utility disk
2. Alice in LOGOLAND
3. LOGO for Apple II - by H. Abelson
4. Alice in Logoland Primer
5. Comprehensive wall chart
6. LOGO & Educational Computing Journal

$89.95

NO FRILLS LOGO AND
ALL THE FRILLS COMBO
FOR APPLE II* $149.95

ALSO AVAILABLE
Time Traveler / Odyssey in Time
Competency/Proficiency Series
Pythagoras and the Dragon
Isaac and F. G. Newton / Micro Deutsch
Super Star Baseball / Sword of Zedek
Krell Game Pak
CALL FOR DETAILS AND PRICES

VISA MasterCard

KRELL®
SOFTWARE CORP.
The state of the art in educational computing
1320 Stony Brook Road / Stony Brook NY 11790
Telephone 516-751-5139

Krell Software Corp. has no official ties with the College Entrance Examination Board or the Educational Testing Service. Krell is, however, a supplier of products to the E.T.S.

*Trademarks of Apple Comp. Corp., Tandy Corp., Commodore Corp. Digital Research Corp., I.B.M., Atari Corp., Terrapin Inc.

PROGRAMS AVAILABLE FOR THE TRS-80, APPLE II, PET & ATARI
N.Y.S residents add sales tax

CIRCLE 217 ON READER SERVICE CARD

ColecoVision, continued...

tages of this design are, however, diminished by the fact that you can still plug a cartridge in while the power is on. If you do plug a cartridge in while the power is flowing, you may destroy the cartridge. There should be a safeguard to prevent such accidents.

On the back of the cabinet, there is a switch which allows you to select TV channel 3 or 4 for game play. This switch is recessed and is hard to get at even with a pencil tip, making it difficult to change—either by design or mistake. Right next to this switch is the video-out RCA connector. To the left of the RCA connector is the power connector. The removable power cable has four prongs arranged so that it can't be plugged in incorrectly—another example of good design.

The right half of the console contains the "guts" of the system. Most of this space is taken up by the main logic board. The left half of the cabinet is a recessed storage area for the hand-held controllers. On the bottom of the storage well is a drawing of the controllers, which indicates which controller is to be used by each player.

Hand Controllers

It always amazes me when I, with excellent hind-sight, notice something *so* wrong that I wonder if the manufacturer had anyone test the product. I feel that way about the hand controllers for the Colecovision, each of which consists of a joystick, two fire buttons, and a keypad. These controllers get high marks for comfortable use, but fall short when it comes to responsiveness.

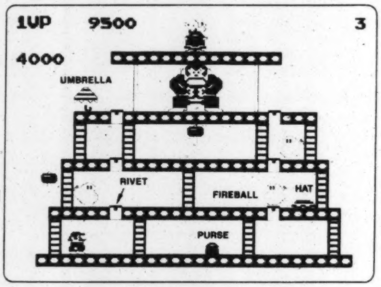
The eight-directional joystick is not really a *stick* at all; it is more like a joy*knob*. At first, I thought that since the knob spun, possibly it doubled as a paddle controller. Not so. Although a joystick and paddle on the same controller is a good idea, it just wasn't meant to be. After an initial break-in period, the joystick does become more responsive and accurate. Even so, I would prefer a real stick that I could grab hold of rather than a small knob. Based on the press releases for it, it appears that the new Atari 5200 video game system has controllers similar to those of the ColecoVision, but with a real joystick.

The two fire buttons on the controller are located directly opposite one another. These buttons are totally independent, which means they can control two different actions. The left button is perfectly positioned for a teen-age hand, but the right one should be just a tad lower for maximum comfort.

The keypad on the controller is used primarily for selecting difficulty levels. The keypad arrangement is similar to that found on a touch-tone telephone. Rather than buttons, there are twelve small, plastic-encased switches on a thin board. Unlike many computer systems that use similar membrane keypads, these switches provide a satisfying click when pressed. There is a slot on the controller that allows a keypad overlay to slide in from the side.

From all obvious signs, the controller is meant to be held in the left hand, with the right hand manipulating the keys and the joystick. One nice thing that proves the designers really *do* care about you, is the small, smooth recess on the controller where your pinkie grips the side. They must have wanted to build a more comfortable controller than those used on other game systems.

The controllers themselves can be detached from the console. Each has a curly cord that, when stretched to limits, measures 5'6". This cord is similar to the cord found on the handsets of most telephones. The ColecoVision designers again tried to make it impossible for you to make a mistake. The plug can be inserted only one way—with the side marked TOP facing up.



Screen 2 of Donkey Kong.

If you don't like these controllers, don't worry. Any controller that works with an Atari VCS or home computer also works with the ColecoVision. When a ColecoVision is plugged into an Atari, only the joystick and left button are functional. If you are using an Atari joystick, you must still have one ColecoVision controller plugged in so that you can select difficulty levels with the keypad, and you must limit yourself to games which use only the left button, as this is the one that corresponds to the Atari fire button.

Power Supply

The ColecoVision unit plugs into a 110/120 VAC outlet. The 5'8" power cord that emerges from the back of the console has a bulky 4.5" x 3" x 2" black plastic power supply at the other end. The purpose of this power supply is to convert the AC into low-voltage DC.

The owner's manual instructs you to remove the power supply when you are not playing, but it is an easy thing to

AARDVARK

TRS-80 COLOR OSI VIC-64 VIC-20 SINCLAIR TIMEX

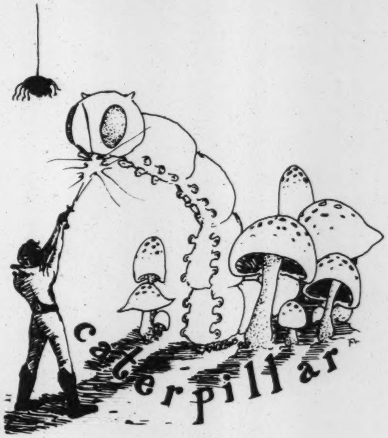
QUEST – A NEW IDEA IN ADVENTURE GAMES! Different from all the others. Quest is played on a computer generated map of Alesia. Your job is to gather men and supplies by combat, bargaining, exploration of ruins and temples and outright banditry. When your force is strong enough, you attack the Citadel of Moorlock in a life or death battle to the finish. Playable in 2 to 5 hours, this one is different every time. 16k TRS-80, TRS-80 Color, and Sinclair. 13K VIC-20. $14.95 each.

ADVENTURES

ADVENTURES!!!

These Adventures are written in BASIC, are full featured, fast action, full plotted adventures that take 30-50 hours to play. (Adventures are interactive fantasies. It's like reading a book except that you are the main character as you give the computer commands like "Look in the Coffin" and "Light the torch.")

Adventures require 16k on TRS80, TRS80 color, and Sinclair. They require 8k on OSI and 13k on Vic-20. Derelict takes 12k on OSI. $14.95 each.



CATERPILLAR

O.K., the Caterpillar does look a lot like a Centipede. We have spiders, falling fleas, monsters traipsing across the screen, poison mushrooms, and a lot of other familiar stuff. COLOR 80 requires 16k and Joysticks. This is Edson's best game to date. $19.95 for TRS 80 COLOR.

PROGRAMMERS!
SEE YOUR PROGRAM IN THIS SPACE!!
Aardvark traditionally pays the highest commissions in the industry and gives programs the widest possible coverage. Quality is the keyword. If your program is good and you want it presented by the best, send it to Aardvark.

ESCAPE FROM MARS

(by Rodger Olsen)

This ADVENTURE takes place on the RED PLANET. You'll have to explore a Martian city and deal with possibly hostile aliens to survive this one. A good first adventure.

PYRAMID (by Rodger Olsen)
This is our most challenging ADVENTURE. It is a treasure hunt in a pyramid full of problems. Exciting and tough!

HAUNTED HOUSE (by Bob Anderson)
It's a real adventure—with ghosts and ghouls and goblins and treasures and problems — but it is for kids. Designed for the 8 to 12 year old population and those who haven't tried Adventure before and want to start out real easy.

DERELICT

(by Rodger Olsen & Bob Anderson)

New winner in the toughest adventure from Aardvark sweepstakes. This one takes place on an alien ship that has been deserted for a thousand years — and is still dangerous!

TUBE FRENZY

TUBE FRENZY

(by Dave Edson)

This is an almost indescribably fast action arcade game. It has fast action, an all new concept in play, simple rules, and 63 levels of difficulty. All machine code, requires Joysticks. Another great game by Dave Edson. TRS 80 COLOR ONLY. 16k and Joysticks required. $19.95.

NEW!
Catch
'Em!

CATCH'EM

(by Dave Edson)

One of our simplest, fastest, funnest, all machine code arcade games. Raindrops and an incredibe variety of other things come falling down on your head. Use the Joysticks to Catch'em. It's a BALL! — and a flying saucer! — and a Flying Y!— and so on. TRS 80 COLOR. $19.95.

BASIC THAT ZOOOMMS!!
AT LAST AN AFFORDABLE COMPILER!

The compiler allows you to write your programs in easy BASIC and then automatically generates a machine code equivalent that runs 50 to 150 times faster.

It does have some limitations. It takes at least 8k of RAM to run the compiler and it does only support a subset of BASIC—about 20 commands including FOR, NEXT, END, GOSUB, GOTO, IF, THEN, RETURN, END, PRINT, STOP, USR (X), PEEK, POKE, *, /, +, -, >, <, =, VARIABLE NAMES A-Z, SUBSCRIPTED VARIABLES, and INTEGER NUMBERS FORM 0-64K.

TINY COMPILER is written in BASIC. It generates native, relocatable 6502 or 6809 code. It comes with a 20-page manual and can be modified or augmented by the user. $24.95 on tape or disk for OSI, TRS-80 Color, or VIC.

Please specify system on all orders

ALSO FROM AARDVARK – This is only a partial list of what we carry. We have a lot of other games (particularly for the TRS-80 Color and OSI), business programs, blank tapes and disks and hardware. Send $1.00 for our complete catalog.

AARDVARK - 80
2352 S. Commerce, Walled Lake, MI 48088
(313) 669-3110

Phone Orders Accepted 8:00 a.m. to 4:00 p.m. EST. Mon.-Fri.

CIRCLE 102 ON READER SERVICE CARD

forget. If left plugged in for an extended period, the power supply gets rather hot, but probably not hot enough to set your house on fire.

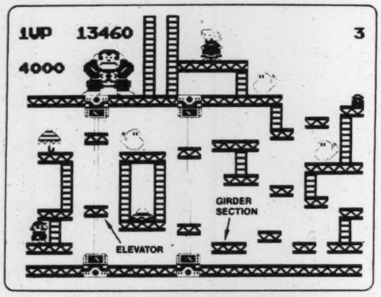
Switch Box and Video Cable

For your convenience, ColecoVision comes with a small box that allows you to switch your TV from normal to game mode. With this box attached to the VHF terminals of the TV and the antenna, you can leave the game connected and easily switch between watching regular TV and playing with your ColecoVision. The cable that runs from the game console to the switch box is a handy 15 feet long.

Cartridge

A free *Donkey Kong* cartridge comes with every ColecoVision system sold. If this cartridge is any indication, future arcade game cartridges should be excellent home versions of popular coin-op games. *Donkey Kong* is licensed to Coleco from Nintendo, the Japanese manufacturer of the coin-op machine.

Donkey Kong plays just like the original coin-op game, with a few exceptions. There are only three different screens in the cartridge program—there is no conveyer belt board. The screens on *Donkey Kong* are very similar to those in the arcade game, but some things had to be changed when the conversion was made to the home system. Remember, most coin-op arcade games are played on monitors that are higher than they are wide; just the opposite is true of home video games.



Screen 3 of Donkey Kong.

The ROM chip that Coleco currently uses in the ColecoVision cartridges is a 4764. The CPU for the game console is a Z80.

The graphics on the ColecoVision are really impressive. The resolution is much higher than that of the Atari VCS and even the Intellivision. There are several brilliant colors which can all be used on the screen at the same time; *Donkey Kong* even boasts a multi-colored Mario.

The graphics are fast moving and smooth. Things don't appear to jump around on the screen as they do in some Atari VCS games (most notably, Pac-Man). The graphics are comparable in every way to an arcade game.

The Future of ColecoVision

When I spoke to the people at Coleco in late August, they planned to have 15 cartridges available by January, 1983. These were, in order of scheduled release: *Donkey Kong, Venture, Cosmic Avenger, Smurf, Ladybug, Mousetrap, Carnival, Turbo, Victory, Zaxxon, Football, Space Panic, Baseball, Tunnels & Trolls*, and *Space Fury*.

And there is good news for Atari VCS and Intellivision owners, too: Coleco plans to release versions of these games for your systems too, but their release dates are later.

Despite the few faults I found with it, ColecoVision is well on its way to becoming the most popular home video system of the 1980's. Due to its low price and the fact that it is expandable, ColecoVision is not as risky an investment as some of the other home systems. It seems to me that in the future, ColecoVision will be the system that all new game machines will have to measure up to.

Coleco Industries Inc., 945 Asylum Ave., Hartford, CT 06105. (203) 278-0280. ☐

CIRCLE 375 ON READER SERVICE CARD

METEOR STORM

MADE
EXCLUSIVELY
FOR THE
*ATARI

Dealer Inquiries Invited

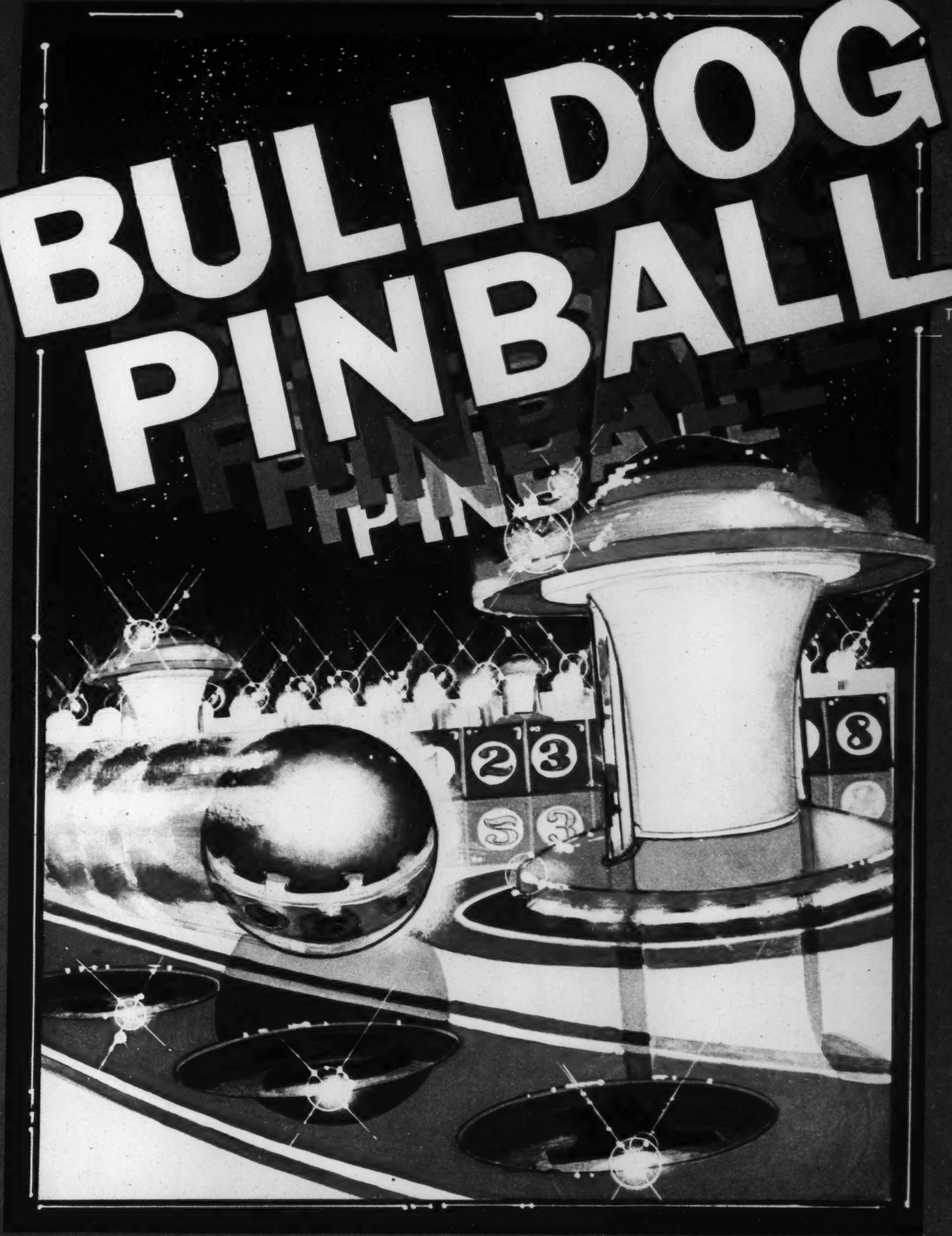
METEOR STORM Is a FAST-ACTION, Arcade Quality, game. Written in machine language especially for the Atari. You, as the Pilot of a Fighter space ship, must rescue as many people from the besieged city of Zarton as you possibly can. You'll have to fight your way through a meteor storm and aliens, with your lasers blasting a path. Then you must dock with the mother ship and safely deliver your precious cargo of human lives. This is your chance to be the HERO of Zarton.

16K Tape or Disk $29.95

Ask for Meteor Storm at your local computer store or order direct from us. Add $2.00 for shipping. Use your Visa, M/C.

Royal Software
2160 West 11th Ave., Eugene, Oregon 97402
(503) 683-5361

CIRCLE 303 ON READER SERVICE CARD



The game that grabs you—and won't let go!

Plug into the high-scoring lanes of Bulldog Pinball and you won't want to get out. It's the fastest pinball game you've ever played. The fascinating world of pinball, brought into the computer age with every carom, every ounce of arcade excitement —even TILT!

Available from your local dealer, or call:

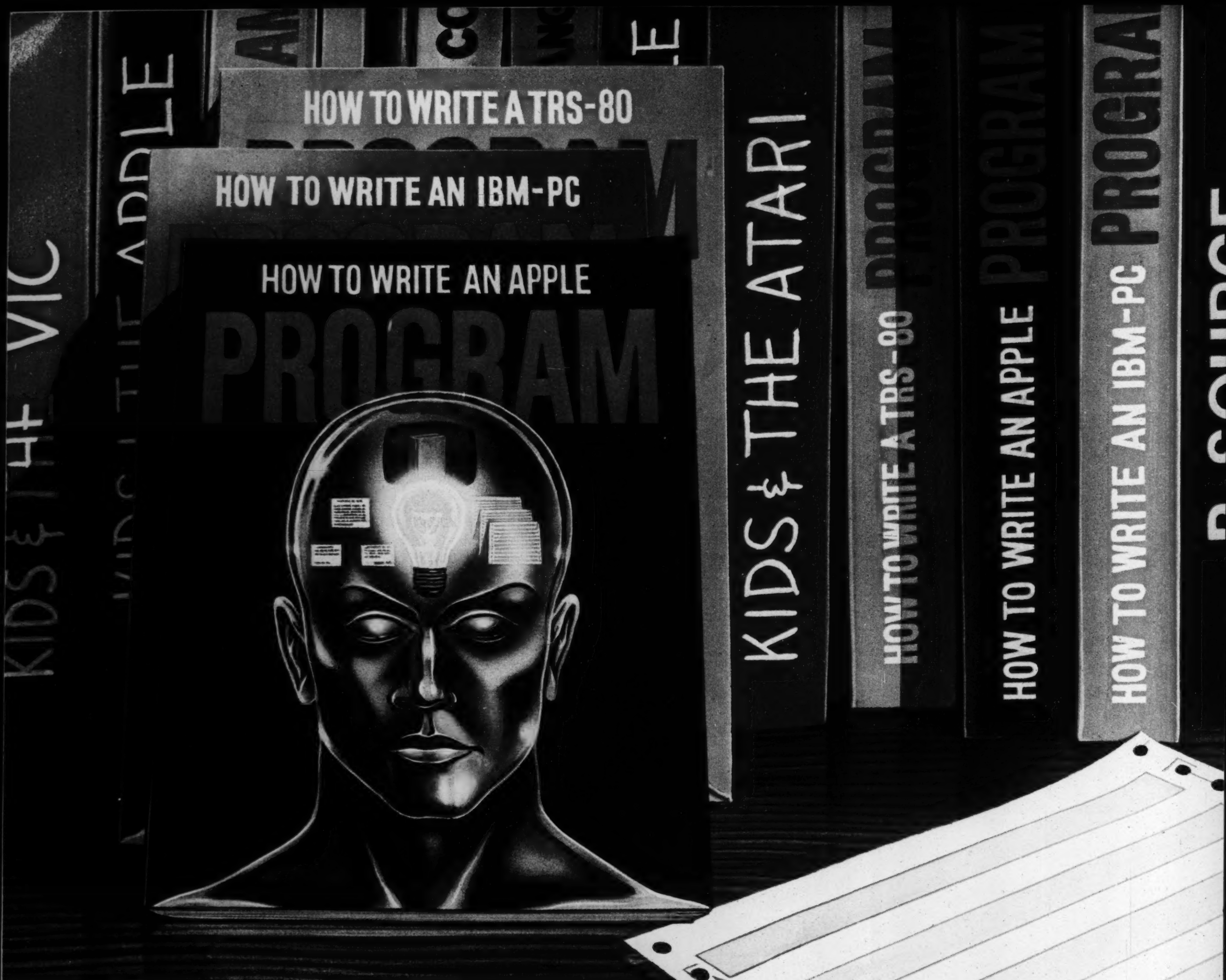
1-800-343-1218

(in MA, call 617-937-0200)

Bulldog Pinball: #19312;
Atari 400 or 800 tape, $29.95

HAYDEN SOFTWARE

CIRCLE 203 ON READER SERVICE CARD


HOW TO WRITE A TRS-80
HOW TO WRITE AN IBM-PC
HOW TO WRITE AN APPLE
PROGRAM
KIDS & THE VIC
KIDS & THE APPLE
KIDS & THE ATARI
HOW TO WRITE A TRS-80 PROGRAM
HOW TO WRITE AN APPLE PROGRAM
HOW TO WRITE AN IBM-PC PROGRAM

3 exceptional books join the DATAMOST library.

INTRODUCING...
HOW TO WRITE A PROGRAM

Here is a series of easy to read, easy to use, easy to understand books, which teach you how to write usable, useful programs on your computer. And you don't have to worry about irrelevant material which has no interest for you, because there are three specific volumes. One for the Apple,* one for the IBM-PC,* and one for the TRS-80.*

In each of these books author Ed Faulk leads you through your favorite computer and takes the mystery out of writing programs for it. As you proceed, interesting chapter by interesting chapter, you'll wonder why you were ever intimidated by the thought of programming!

If you want to get the very most out of your Apple, IBM-PC or TRS-80 then you really want HOW TO WRITE A PROGRAM. Before you're past Chapter 2 you'll be programming. By the end of the book you'll be willing to tackle business programs, personal use programs and even games and adventures! **$14.95**

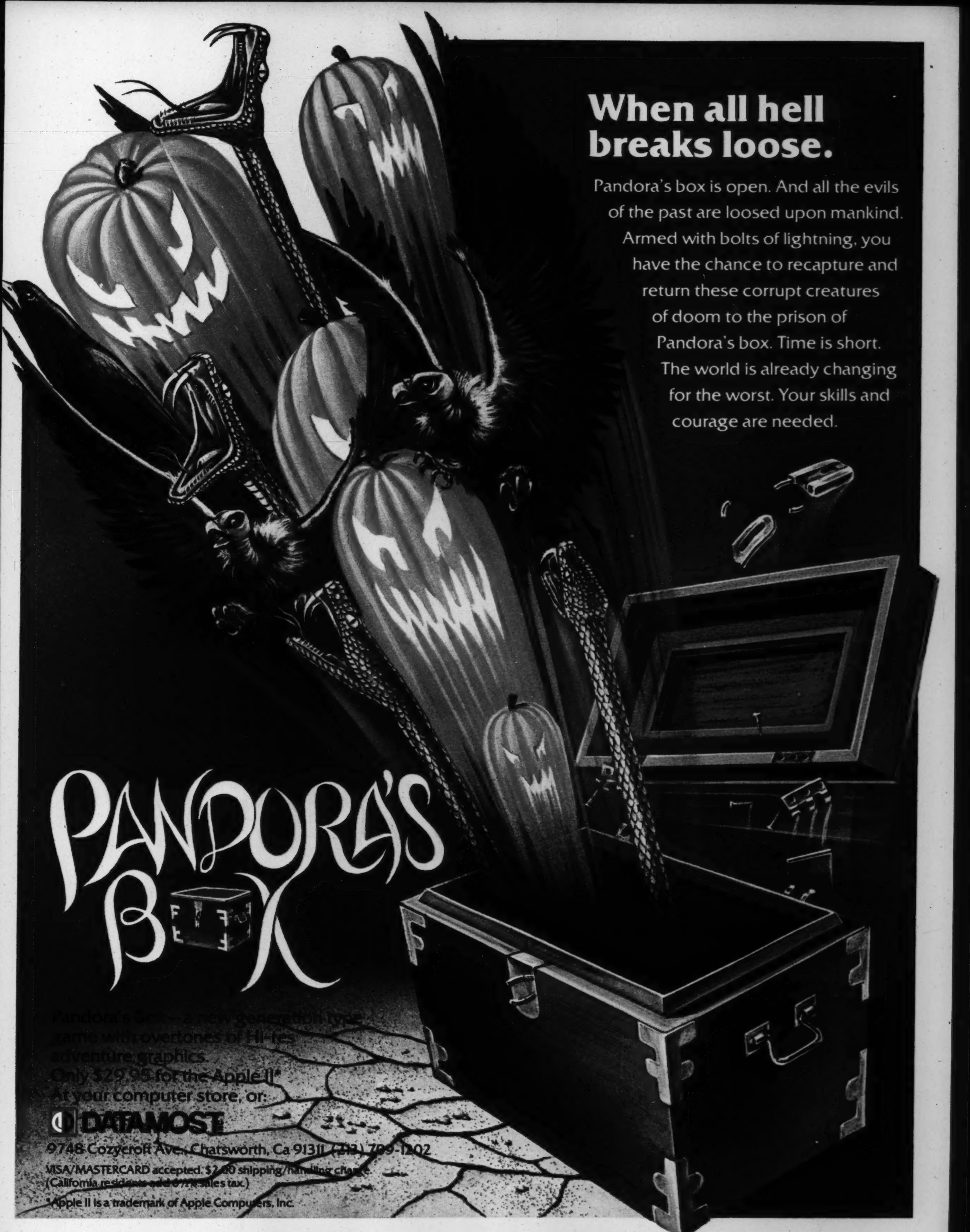
Get your copy now. Available at computer and book stores, or:

DATAMOST (213) 709-1202
9748 Cozycroft Ave., Chatsworth, CA 91311

Reston Publishing Company, Inc.
A Prentice-Hall Company
Reston, Virginia
Toll free (800) 336-0338

Apple is a trademark of Apple Computer, Inc. IBM-PC is a trademark of IBM Corp. TRS-80 is a trademark of Tandy Corp.
VISA MASTERCHARGE accepted. $2.00 shipping handling charge. (California residents add 6½% sales tax.)

CIRCLE 170 ON READER SERVICE CARD



When all hell breaks loose.

Pandora's box is open. And all the evils of the past are loosed upon mankind. Armed with bolts of lightning, you have the chance to recapture and return these corrupt creatures of doom to the prison of Pandora's box. Time is short. The world is already changing for the worst. Your skills and courage are needed.

PANDORA'S BOX

Pandora's Box—a new generation type game with overtones of Hi-res adventure graphics.
Only $29.95 for the Apple II*
At your computer store, or:

DATAMOST
9748 Cozycroft Ave., Chatsworth, Ca 91311 (213) 709-1202

VISA/MASTERCARD accepted. $2.00 shipping/handling charge.
(California residents add 6½% sales tax.)

*Apple II is a trademark of Apple Computers, Inc.

CIRCLE 171 ON READER SERVICE CARD

Friendly aliens? Forget it!

You're stationed on an asteroid as a welcoming committee for a new race of aliens. But you find out the hard way they believe the only good Earthman is a dead one! You and your IBM-PC controlled lasers are the only defense between them and the inner planets and Earth itself. The fighting is fierce, the odds tremendous, but if you fight the alien battalions hard enough and long enough you can at least delay their advance.

Space Strike has all the excitement, firepower and competitiveness that first made computer games such smash hits.

So help save the Earth while you enjoy the most absorbing and fascinating game available for your IBM-PC.

SPACE STRIKE

Exclusive for the IBM-P

Requires color graphics adapter

Only $29.95

at your computer store, or from:

DATAMOST (213) 709-1202

9748 Cozycroft Ave., Chatsworth, CA 9131

VISA MASTERCHARGE accepted. $2.00 shipping/handling charge. California residents add [illegible] sales tax.

CIRCLE 172 ON READER SERVICE CARD

Become a millionaire! [illegible] No difficult work involved, no [illegible] education necessary. All it takes is [illegible] of courage plus swift reaction and quick thinking.

The money you want is right there in front of you: all those beautiful $$$ signs [illegible] tremendous wealth. Just run through the maze and grab it as you go. Simple, right? Sure it is. But keep a sharp lookout because the Money Munchers' gang want that loot for themselves.

Outwit the mean *Money Munchers* and get to upper levels and what happens? Why the real trouble begins . . . because now there are special, nasty Guardians to help the *Money Munchers*. While the munchers pick up the bucks, the Guardians follow your trail—and if you let them catch you you'll only be remembered as the richest man in the cemetery!

Ah, but the riches that can be yours if you reach the top level alive! Yes, this is your chance to collect the kind of $$$ you've dreamed about. All it takes is courage . . . and a great survival instinct!

Beware the MONEY MUNCHERS

WHOLE LOTTA FUN

For the most maze fun you've ever had **and thousands of random mazes,** get MONEY MUNCHERS today—be a millionaire tonight!

by Bob Bishop

$29.95 for the Apple II*
At computer stores, or:

DATAMOST INC
9748 Cozycroft Ave., Chatsworth, CA 91311. (213) 709-1202

CIRCLE 173 ON READER SERVICE CARD

VISA/MASTERCARD accepted. $2.00 shipping/handling charge.
(California residents add 6½% sales tax.)

*Apple II is a trademark of Apple Computer, Inc.

creative computing
software evaluation

Stocking Stuffers

Games for Apple, TRS-80 and Atari

GAMES
Apple II
Dale Archibald

Choplifter

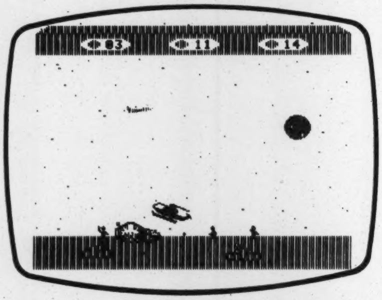
The Bungeling Empire is Broderbund's favorite adversary. In *Starblazer* the player attacked it with a WWIII jet. The scenario has changed for *Choplifter*, and I'll let you select which country might best represent the Bungelers today.

The Bungelers have taken 64 hostages from the U.N. Conference on Peace and Child Rearing and crammed them into four barracks near the eastern border.

You, the leader of the Sanguinistas, have a helicopter with enough parts for three missions. It is loaded with unlimited fuel, bombs, and rockets.

From your command post (a U.S. Postal Service distribution center) just east of the boundary line, you receive word that one of the barracks has exploded and caught fire. The hostages are running free temporarily, looking for help. This may be your chance.

Lifting off in your helicopter, you hit one of the buttons—the movement button—on your joystick. This spins the chopper around to face west. Push the second button and you fire in the direction you are facing to test your guns.



Pressing the movement again and holding it, you swing all the way east. A short jab at it turns you halfway back, perpendicular to the sentry moon.

Tilt the chopper in the direction you want to go, and you flutter across the border. A Bungeling tank, green against the pink sand below, fires helplessly at you. (It might sound like odd camouflage, but in black and white, the tank is almost invisible.)

You see a hostage waving at you, and another. An enemy tank outraces them as you start to set down. Pull the joystick back, and you lift up again.

You are perpendicular to the tank, so you can drop bombs while it moves back and forth firing. Ease the stick over and push the fire button as fast as you can. The bombs fall and explode with noise and flare on the surface until you hit the tank. All is quiet again for a while.

You land, level the chopper carefully, and watch the hostages come running to your craft.

The animation in this game is amazing. The helicopter lifts and tilts, the 1/4"-tall hostages wave and run, jets come in and turn to fire two rockets, fires and explosions rage...the American flag on the distribution center even appears to wave in the electronic breeze.

Once you have landed the first 16 hostages, you must decide how to free the remaining groups so that you can load and save them.

creative computing
SOFTWARE PROFILE

Name: Choplifter

Type: Arcade helicopter action

System: 48K Apple II or II+, DOS 3.2 or 3.3 disk drive; joystick optional; soon available for the 32K Atari 400/800

Format: Disk

Language: Assembly

Summary: Unending, realistic action.

Price: $34.95

Manufacturer:
Broderbund Software
1938 Fourth St.
San Rafael, CA 94901

Dan Gorlin's program is impressive. The joystick controls are touchy enough to make a novice bounce the 'copter around like it's doing the pogo. The movements of the little hostages are correct down to their wave from the P.O. after they have been freed.

Even the way the jets peel off and fire their miniscule missiles is well done: the aircraft get larger as they get closer and turn into their attack run. The three-dimensional effect is very good.

The player's score is based on the number of hostages safely freed. At the top of the screen are displayed the numbers which tell how many hostages have been killed, how many are aboard the airship, and how many are safely at the distribution center. There is nothing to be gained by blasting tanks, jets, or the smart bombs.

Tanks can only hit the 'copter when it is on the ground loading escapees. The jets can occasionally hit the copter on the ground, and often in the air. The smart bomb will ram in the air, or rain bombs if the craft is loading. You can also fly right into the ground, if you aren't careful.

While you try to save them, hostages will be mowed down by tank fire, rockets, or bombs. They can also be squashed by the helicopter if you aren't careful, or hit by the blade if the machine isn't firmly on the ground.

It is an unusual concept carried out well.

Gorgon

A cloud of sparks glows, then coalesces, shrieking into a winged beast that instantly swoops toward a helpless human on the surface of the planet. In a desperate attempt to dive fast enough to destroy the being, you hammer the control panel on your fighter.

creative computing
SOFTWARE PROFILE

Name: Gorgon

Type: Arcade game of the Defender genre

System: 48K Apple II or II+, DOS 3.2 or 3.3 disk drive

Format: Disk

Language: Assembly

Summary: Another finger-twister from Sirius.

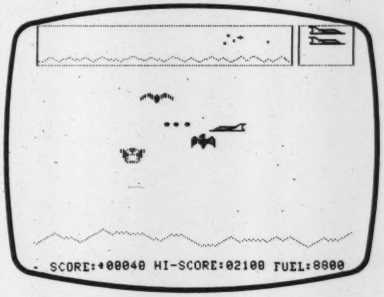
Price: $39.95

Manufacturer:
Sirius Software, Inc.
10364 Rockingham Dr.
Sacramento, CA 95827

Even as you begin your dive, another cloud of sparks shrieks and begins to form behind you, but you haven't time to deal with that creature yet. It forms a gleaming red head, its jaws opening and closing malevolently, explosive homing eggs spewing from it.

No! Your target has seized the human and is beginning to rise from the earth. You have one chance left. You must blast the creature and catch the human as he falls.

Fire...fire again! Got it! Now to swoop in: saved. Must drop to the surface and release the victim, then climb up to deal with the others.



```
SCORE:•00040 HI-SCORE:02100 FUEL:8800
```

At the top of your screen, you watch the sensor radar plot of the enemy. The main screen view is but one small part of the entire planet surface. You can, in fact, exit at the left and reenter at the right. So can the creatures.

Scientists believe these beasts have entered earth's atmosphere from a time warp. Perhaps the most dangerous of them are birdlike creatures, some of which launch homing explosive eggs as the head does. Others just attack your fighter. Only one type steals humans—for some purpose you aren't eager to discover. All, however, will destroy your ship by ramming.

To add to your problems, you have a limited amount of fuel. When it runs low you must thread your way through a gauntlet of sensor satellites.

Touch the satellites and you lose a ship, so refueling can be as dangerous as actual battle.

To confound you even more, if you swoop too low when trying to destroy a kidnapping flyer, you kill the human yourself. You know what the media will do with that.

The Gorgons were the Greek triad of sisters that included Medusae. One glance at her head would turn a person to stone. As a result, she is reputed to be the prototypical blind date. (She was about a -10 billion; snakes for hair, you understand.)

None of the gals flew around kidnapping people.

Gorgonize, however, has come to mean petrify (as with fright). *Gorgon* has just the opposite effect: you react fast and wish you were faster.

It is a solitaire space battle with no paddle or joystick control. Instead, you use the keyboard. A moves the ship up, Z puts it into a dive. The arrow keys move it in the corresponding direction, while the space bar fires.

If you press the motion keys rapidly, you enjoy steady progress. Press them moments apart and you move, stop, then move again. This is true for the battle and refueling segments both.

The small sensor screen at the top signals your location with a + sign. You can track the enemy with that, while evading their missiles.

The missile bird tends to head straight for the top of the screen, only dropping when you are in another frame. You must react instantly to destroy it as it swoops.

Nasir seems to have programmed the majority of his creatures to defend the kidnappers. They tend to hover above the scene of the crime, forcing you to manuever well.

You can pause, restart the game, and turn the sound effects off.

This game by Nasir (written before he left Sirius) offers splendid animation, graphics, and appropriate sound. Even a beginner will enjoy it, although he may not do too well at first.

Nightmare Gallery

Good evening. I'd like to welcome you to Nightmare Gallery. We have assembled a small group of funloving guys and ghouls to...recruit you.

There are vampires, ghosts, werewolves and ghouls. Don't bother crying for your mummy: he's here also. The tombstones or mausoleums are just here for—shall I say—shelter?

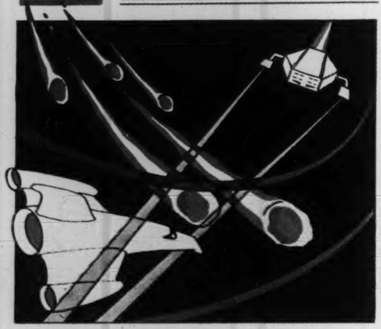
CRASH & BURN!
100

"I warned you about playing that video game!"

Great Games From Piccadilly Software Inc.

Piccadilly Software Presents

Star Blaster



Piccadilly Software Presents

Falcons

Piccadilly Software Presents

Warp Destroyer

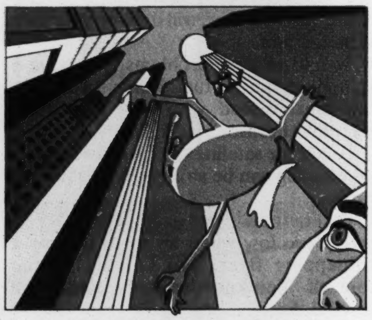
Piccadilly Software Presents

Survival

COMING IN THE 2ND HALF OF 1982

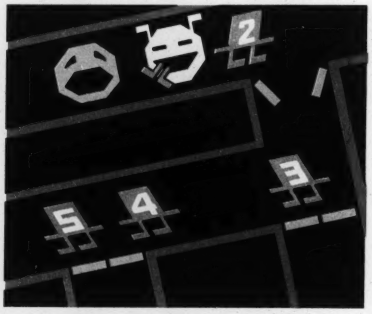
Piccadilly Software Presents

Suicide!



Piccadilly Software Presents

Succession



Available at your local dealer.

Requires: APPLE II/APPLE II PLUS with 48K in Dos 3.3 or 3.2 • APPLE III

Piccadilly Software Inc. • 89 Summit Avenue • Summit, N.J. 07901 • (201) 277-1020

If you're unable to obtain Piccadilly Games from your local dealer, send $29.95 per game plus $1.50 per order for postage and handling. NJ residents add 5% sales tax. Outside US, send $3.00 per order for shipping.

*Apple is a registered trademark of Apple Computer Inc.

CIRCLE 271 ON READER SERVICE CARD

I strongly suggest you turn the sound off on your Apple. The sudden shrieks that emanate from it are enough to wake the dead.

It is my sad duty to supply you with these three revolvers and an endless supply of bullets. You will forgive me for pointing at them, I'm sure. I have a slight allergy to silver. I'm also pledged to give you these three temporary shields, proof against the undead...but not our ghost companions.

Our playful little group's desire is to have you join us, permanently. We can't understand your reluctance, and will try to persuade you. Won't you join our party?

You, with your filthy pistol, must try to shoot us as we gambol from tombstone to mausoleum. As we dance from row to row, your fire retires us to whence we came. Strike a fleabitten werewolf; he turns into a mossy tombstone. A handsome vampire bat, however, becomes a striking mausoleum.

Luckily for us, these monuments stop your fire. Oh, you'll chip them away as you continue shooting, but others are built by the mummies and the falling ghosts the ghouls drop. The mummies walk from the top of the screen down toward you, leaving columns of monuments; the ghosts plummet, also adding monuments.

If you hit a ghost as it falls, you won't kill it, but you may gain extra shields. Bullets ripping through the mummy can destroy the monuments it replaces, although the mummy won't be harmed.

As for the rest of us, the werewolves dance from column to column. Two columns side by side give them the shortest path. Should the columns be separated by a space, they will be forced to cross that space, targets for your fire.

creative computing
SOFTWARE PROFILE

Name: Nightmare Gallery

Type: Arcade game in Centipede genre

System: 48K Apple II or II+, DOS 3.3 disk drive; paddles optional

Format: Disk

Language: Machine

Summary: A scream (in the night)

Price: $34.95

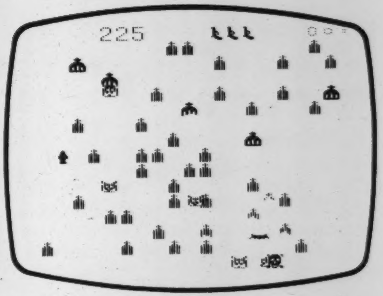
Manufacturer:
Synergistic Software
5221 120th Ave., S.E.
Bellevue, WA 98006

Vampires fly down toward you leisurely. Either species may, with a cheery shriek, embrace you and your pistol if they successfully reach the bottom of the screen. The mummy and ghost must fall on you for the happy conversion.

Oh, you can foil our recruiting efforts for a while if you wish to be a spoilsport, by using one of your shields. While it lasts, however, you can't shoot.

You'll even earn extra pistols at three different levels for decimating our ranks.

When at last we gather you into our fold, you will be able to leave a permanent record of your foolish struggle for posterity. If you tire during the fight, you may pause. But should you hesitate during the fight...you'll be retired.



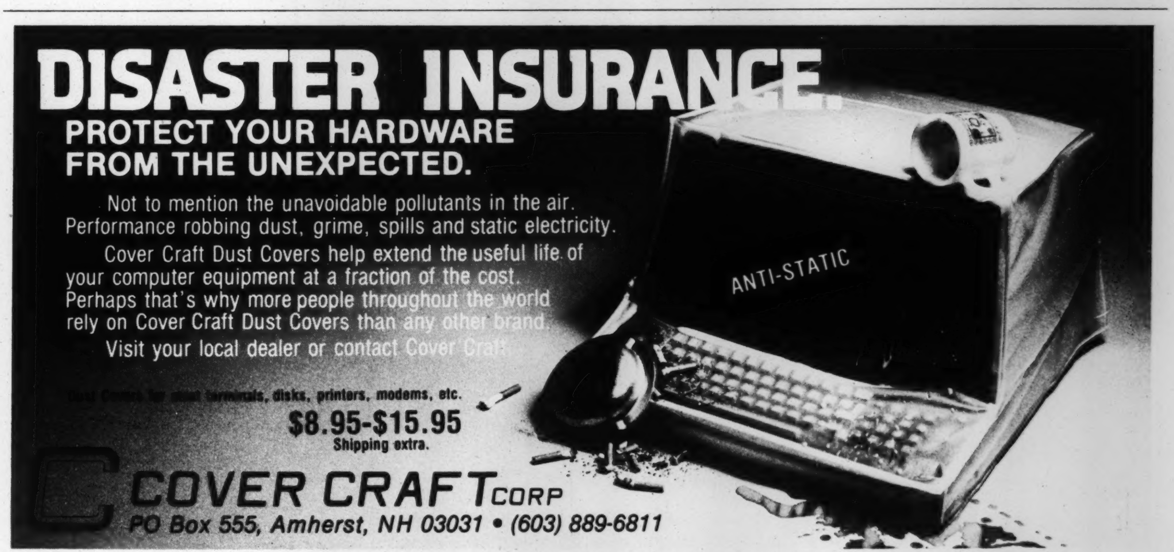
This is splendid Halloween entertainment all year around. Concept and execution are hilarious, and the package cover featuring Robert Clardy and Ron Aldrich's names is excellent. One complaint: there was no envelope to protect the diskette. The package was punched for a three-ring binder, but I keep my disks in a box. Please include envelopes in products.

Oops. I see the sky beginning to lighten in the East. Our little band must leave you now. Don't relax, though. We'll be back again.

Space Eggs

Space Eggs is an early Nasir Gebelli program with lots of movement, color, and smooth animation. Nasir must have been influenced by the movie *Alien* when he designed this one.

In it, you patrol space in your three-piece steam-operated calliope-cum-spaceship, charged with keeping the peace. Your ship divides when you sight the


DISASTER INSURANCE.
PROTECT YOUR HARDWARE FROM THE UNEXPECTED.

Not to mention the unavoidable pollutants in the air. Performance robbing dust, grime, spills and static electricity.

Cover Craft Dust Covers help extend the useful life of your computer equipment at a fraction of the cost. Perhaps that's why more people throughout the world rely on Cover Craft Dust Covers than any other brand.

Visit your local dealer or contact Cover Craft.

Dust Covers for most terminals, disks, printers, modems, etc.
$8.95-$15.95
Shipping extra.

COVER CRAFT CORP
PO Box 555, Amherst, NH 03031 • (603) 889-6811

CIRCLE 167 ON READER SERVICE CARD

creative computing

SOFTWARE PROFILE

Name: Space Eggs

Type: Arcade shot-'em-up

System: 48K Apple II or II+
DOS 3.2 or 3.3 disk drive,
paddle or joystick

Format: Disk

Language: Assembly

Summary: A twisting, tootling terror

Price: $29.95

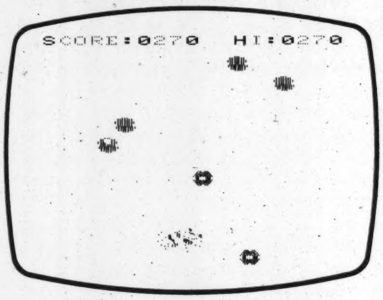
Manufacturer:
Sirius Software, Inc.
10364 Rockingham Dr.
Sacramento, CA 95827

vicious space eggs. You attack first with your single-gun nose wing.

The three-color eggs dance and swirl and change colors at the top of the screen as you sweep back and forth beneath them. Hit one and it hatches to release a space spider. If you fire desperately at the spider to keep it from ramming you, you are liable to hit and hatch another egg.

Clear the screen of the spiders, and more eggs appear. This time, a stricken egg hatches into the dreaded lips. If you escape their kiss of death, you move on to a flight of wolves, followed by hairy-eyed fuzzballs.

Should you fail to shoot all their lights out before they ram you, your second midsection ship sporting two guns replaces the nose wing. However, it begins back with the allotted clutch of eggs, again hatching spiders first.



If you are lucky enough to get 1000 points with either the nose wing or the midsection, you have an opportunity to duck the first stage with the second. That gives you three shots at once, but the ducking procedure is not easy.

Usually, though, you must bring up your last line of defense. The third and last section of your ship also has two guns, but it is a big target.

The ships respond a bit slowly to the paddle, I felt. I would like to have the shots go faster, too. This is a game for people with quick reflexes and long fuses.

I found no pause feature, nor any way to turn off the sound. *Space Eggs* is an interesting variation on the MBAFAS (Move Back and Forth And Shoot) theme.

Beer Run

I'm going to call this a ladder game, as in the "ladder genre," which includes *Apple Panic* and Donkey Kong.

Genre is one of those critical words writers use to make people think they

creative computing

SOFTWARE PROFILE

Name: Beer Run

Type: Ladder arcade game

System: 48K Apple II or II+,
DOS 3.2 and 3.3 disk drive;
paddle, joystick, or Sirius
Joyport optional

Format: Disk

Language: Assembly

Summary: The Galumphing Gourmet visits Olympia

Price: $29.95

Manufacturer:
Sirius Software, Inc.
10364 Rockingham Dr.
Sacramento, CA 95827

48K
Apple II Plus
ROM Applesoft
DOS 3.3
Printer Optional

$30

MICRO BARMATE

The Computer Age Bar Guide
for parties and casual entertaining

Tell Micro Barmate what you have...
It'll tell you what you can make

- Mix a drink according to your stock of ingredients
- Select by classification, ie: cocktails, cordials, aperitifs
- Create and enter your own specialties
- Select from our Ingredient Index

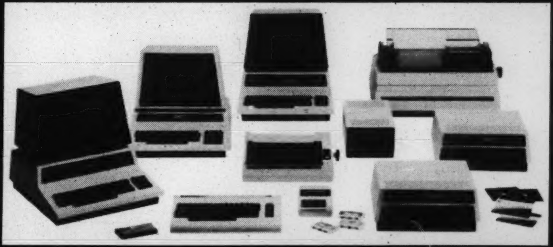
PLUS Hundreds of Unusual & Popular Drinks

- Complete Holiday Beverage Guide
- Party planning
- Useful measurements
- Alcohol limit guide
- How to make your own liqueurs
- Proof table
- Ultra fast
- On-line instructions
- Completely menu driven
- Many print functions provided

ORDER NOW VISA, Mastercard or checks accepted
Virtual Combinatics, P.O. Box 755, Rockport, MA 01966 617-546-6553
Apple is the registered trademark of Apple Computer, Inc. MA residents add 5% sales tax

CIRCLE 361 ON READER SERVICE CARD

SJB DISTRIBUTORS. THE MOST COMPETITIVE PRICES ON COMMODORE PRODUCTS.



commodore

INTERFACES

ADA-1450 Serial	$149
ADA-1600 Parallel	149
RS232 cable for Vic or 64,6m	30
Video Audio cable for 64 & monitor	25

MONITORS — Great resolution for the CBM 64 or VIC

Panasonic, 16" Color	$360
Amdek Color I	360
Panasonic, 9" b&w	130

BUSINESS SOFTWARE

Spellmaster Dictionary (great for WordPro!)	$199
OZZ Data Base System (8050)	240
Silicon Office (database, wp)	995 (New)
Wordcraft 80	289
VisiCalc (new expanded)	199
Dow Jones Portfolio Management System (RS232)	120
WordPro 4 + or 5 +	299
The Manager	199
Galaxy One (games)	39
Legal Time Accounting	425
I.R.M.A.	295
BPI A.R. G.L. Job Cost, Inventory, Payroll	325/pkg

SJB carries many other lines of equipment and products. Call us for our new fall catalogue.

MasterCard, Visa, Money Order, Bank Check

COD (add $5) accepted.
Add 3% surcharge for credit cards.
In stock items shipped within 48 hours, F.O.B., Dallas, TX.
All products shipped with manufacturer's warranty.

TO ORDER CALL TOLL FREE
800-527-4893 800-442-1048 (Within Texas)

SJB will meet any competitive price under similar in-stock conditions.

SJB DISTRIBUTORS, INC.
10520 Plano Road, Suite 206
Dallas, Texas 75238
(214) 343-1328

Prices are subject to change without notice.

SOFTWARE FOR CBM 64

Word Processing	$80
Computer Tutoring Game	50
CBM EasyCalc (for the 64)	call
CBM EasyFinance	call
CBM EasyPlot	call
CBM EasyScan (appointment manager)	call
Sprite-Magic (build sprites on screen, save to disk or cassette)	30
Assembler Package for CBM 64 (cassette) Editor (creates and updates source code), Assembler, Loader, Disassembler	50
Mailing List	50
IEEE Interface	90
Parallel Interface	99
RS232 Interface (modems, printers)	40

VIC PRODUCTS

VIC 20 Computer, 5K	$199
Vic Datasette Recorder	60
Vic 1540 Disk Drive	467
VIC MODEM (for CBM 64)	100
VIC 1525 Graphic Printer (for CBM 64)	325
8K Memory Expansion Cartridge	49
16K RAM	95
24K RAM	149
IEEE Interface	80
Gorf (great arcade game)	$39
Omega Race	39
Midnight Drive	23
Super Alien	23
Vic Super Expander	55
Vic Cassette Recreation Pack	46
Vic Cassette Home Finance Pack	46

Arcade Joysticks — Heavy duty with 2 firing buttons! Great for the VIC or 64	**$25**
SuperPET (5 languages, 2 processors)	$1409
CBM 8032 Computer, 80 column	1029
CBM Memory Expansion, 64K	359
PET 4032,40 Column	795
CBM 8050,1Mg. Dual Drive	1259
CBM 8250,2Mg. Dual Drive	1760
CBM D9060,5 Mg. Hard Disk	2795
CBM D9090,7.5 Mg. Hard Disk	3195
CBM 4040,340K Dual Drive	919
CBM 2031,170K Single Drive	489

PRINTERS — LETTER QUALITY

CBM 8300,40cps	$1450
Diablo 620,25cps	1350
Nec Spinwriter 7700,55cps	2350
Nec Spinwriter 3500,35cps	1600

PRINTERS — DOT MATRIX

CBM 4022,80cps graphics	$395
CBM 8023,150 cps/graphics	589
Okidata 82A,120cps/serial or par	449
Nec 8023A(parallel)	499

CIRCLE 313 ON READER SERVICE CARD

know what they're talking about. (At times, it is a polite way to say "copy.")

E.B. White wrote the best description of critical words in *The Elements of Style* (Strunk and White). He termed them "words that at first glance seem freighted with delicious meaning but that soon burst in air, leaving nothing but a memory of bright sound."

Genre, proclaims my dictionary, means a variety or type. It is still a writer's buzzword.

So *Beer Run* is a ladder game. As such, it is at the top of the ladder for animation, speed, and enjoyment.

The game was written by Mark Turmell, and he must have had a ball. The scenario is to catch Artesians, bouncy little characters that abound in the Sirius Building and the Olympia Brewery building next door.

You are a beer runner. Trying to thwart you are green guzzlers (about the color I turn after a few too many), and the bouncers. The guzzlers move across the floors, and up and down the ladders; the brawny white bouncers appear to be confined to one floor.

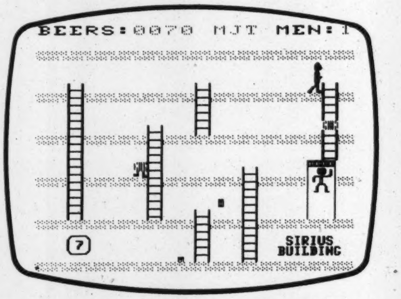
You can see several floors at one time, with ladders between them. At one level is an elevator, which can disappear and reappear on another floor, with an arrow pointing in the direction it is heading.

Using either the keyboard or paddle, you can move back and forth on the screen. By pressing the space bar or paddle button when your runner alter-ego is in an elevator or at a ladder, you can make him move up or down.

Any time you take a ladder that extends to a floor above, you go up. You can only go down on ladders that end at the platform you are on. This is important: if you are on a ladder that extends up and down you always go up.

Your score mounts up in a number of ways and is stored on disk. First, the Artesians will drop cans of beer for you. Each one you catch with your outstretched hand adds another point to your score. Kegs sometimes appear on the screen; collect them and you earn the number of points written on the keg.

You gain 25 beers each time you ride an elevator, plus a bonus depending how close to the Artesians you are.



When you reach the top of the Sirius Building, you have a chance to catch a blimp to the building next door. The blimp lowers a rope. If you catch it on the first try, you earn 200 points and a runner. If you catch it on the second or later pass, you receive 50 points and an extra runner.

Once in the Olympia Building, you must reverse your direction and work your way down to the basement. If you are lucky, you'll nab an Artesian and receive bonus points. Should you reach the basement without doing so, you still earn an extra runner. (You begin with three.)

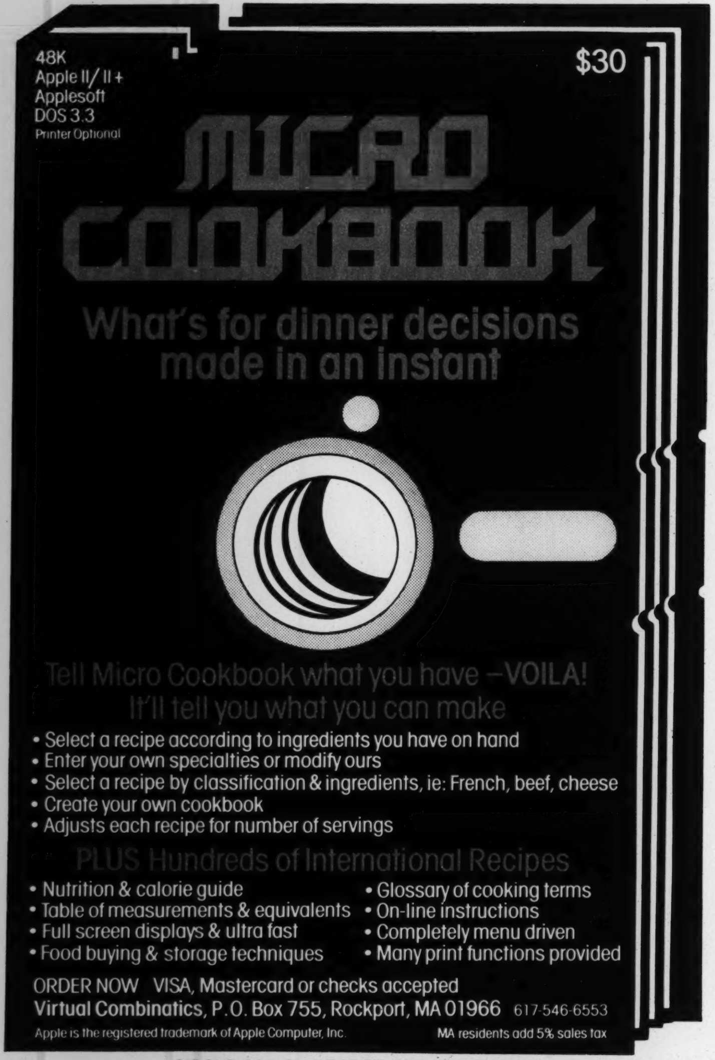
Avoid being trapped by either the guzzlers or the bouncers. They will defenestrate you (toss you out a window), and the graphic will show you falling.

You can pause the game, restart, and turn off the sound effects. It is fast and funny, but frequently frustrating.

Track Attack

This has to be the game I know the most about. Not because I play it often, however. It and *The Complete Graphics System* from Penguin Software were the subject of an article I wrote about designing commercial software.

Chris Jochumson wrote this because Doug Carlston feels "he does well with things that folllow paths." (Chris also did


48K
Apple II/ II+
Applesoft
DOS 3.3
Printer Optional

$30

MICRO COOKBOOK

What's for dinner decisions made in an instant

Tell Micro Cookbook what you have —VOILA!
It'll tell you what you can make

- Select a recipe according to ingredients you have on hand
- Enter your own specialties or modify ours
- Select a recipe by classification & ingredients, ie: French, beef, cheese
- Create your own cookbook
- Adjusts each recipe for number of servings

PLUS Hundreds of International Recipes

- Nutrition & calorie guide
- Table of measurements & equivalents
- Full screen displays & ultra fast
- Food buying & storage techniques
- Glossary of cooking terms
- On-line instructions
- Completely menu driven
- Many print functions provided

ORDER NOW VISA, Mastercard or checks accepted
Virtual Combinatics, P.O. Box 755, Rockport, MA 01966 617-546-6553
Apple is the registered trademark of Apple Computer, Inc. MA residents add 5% sales tax

CIRCLE 362 ON READER SERVICE CARD

Electronics Div. Card #1

RUSH THIS POSTAGE-PAID CARD FOR YOUR FREE CATALOG

NO SALESMAN WILL CALL

NEW!

- Computer electronics with new TRS-80 Model III state-of-the-art computer
- TV/Audio/Video servicing with choice of computerized Heath/Zenith color TV, videocassette recorder, or stereo system
- Industrial Electronics for Instrumentation and Control technicians with TRS-80 Color Computer for hands-on training
- Electronic Design Technology with design lab program for creative circuit and equipment design

WE'LL TRAIN YOU FOR THE GOOD JOBS!
NRI HOME TRAINING IN
SMALL ENGINE REPAIR
NRI
Home Training in
Air Conditioning,
ELECTRONICS

CHECK ONE:

☐ Microcomputers and Microprocessors
☐ Color TV, Audio, and Video System Servicing
☐ Digital Electronics
☐ Electronics Design Technolgy
☐ Industrial Electronics
☐ Communications Electronics • FCC Licenses • Mobile • Aircraft • Marine
☐ Basic Electronics
☐ Small Engine Servicing
☐ Appliance Servicing
☐ Automotive Servicing
☐ Auto Air Conditioning
☐ Air Conditioning, Heating, Refrigeration, & Solar Technology
☐ Building Construction

Name (Please Print) Age

Street

City State Zip

All career courses approved under GI Bill. ☐ **Check for facts.**

DD

Accredited by the Accrediting Commission of the National Home Study Council

175-122

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 10008 WASHINGTON, D.C.

POSTAGE WILL BE PAID BY ADDRESSEE

NRI Schools
McGraw Hill Continuing
Education Center
3939 Wisconsin Avenue
Washington, D.C. 20016

Everybody's making money selling microcomputers. Somebody's going to make money servicing them.

New NRI Home Study Course Shows You How to Make Money Servicing, Repairing, and Programming Personal and Small Business Computers

Seems like every time you turn around, somebody comes along with a new computer for home or business use. And what's made it all possible is the amazing microprocessor, the tiny little chip that's a computer in itself.

Using this new technology, the industry is offering compact, affordable computers that handle things like payrolls, billing, inventory, and other jobs for businesses of every size…perform household functions including budgeting, environmental systems control, indexing recipes. And thousands of hobbyists are already owners, experimenting and developing their own programs.

Growing Demand for Computer Technicians

This is only one of the growth factors influencing the increasing opportunities for qualified computer technicians. The U.S. Department of Labor projects over a 100% increase in job openings for the decade through 1985. Most of them *new* jobs created by the expanding world of the computer.

Learn at Home in Your Spare Time

NRI can train you for this exciting, rewarding field. Train you at home to service not only microcomputers, but word processors and data terminals, too. Train you at your convenience, with clearly written "bite-size" lessons that you do evenings or weekends, without going to classes or quitting your present job.

Your training is built around the latest model of the world's most popular computer. It's the amazing TRS-80™ Model III, with capabilities and features to perform a host of personal and business functions. No other small computer has so much software available for it, no other is used and relied on by so many people. And it's yours to keep for personal or business use.

(TRS-80 is a trademark of the Radio Shack division of Tandy Corp.)

You get plenty of practical experience. Using the NRI Discovery Lab® that also comes as part of your course, you build and study circuits ranging from the simplest to the most advanced. You analyze and troubleshoot using the professional 4-function LCD digital multimeter you keep to use later in your work. Then you use the lab and meter to actually access the interior of your computer…build special circuits and write programs to control them. You "see" your computer at work and demonstrate its power.

Computer Assisted Instruction

Your TRS-80 even helps train you. You receive 4 special lesson tapes in BASIC computer language. Using them in your microcomputer, you "talk" to it as you progress. Errors are explained, graphics and animation drive home key points. Within a matter of minutes, you'll be able to write simple programs yourself.

Become the Complete Computer Person

In addition to training in BASIC and advanced machine language, you gain hands-on experience in the operation and application of computers to business and personal jobs. You're trained to become the fully rounded, new breed of technician who can interface with the operational, programming and service facets of today's computers. You're ready to take your place in the new electronic age.

Other Opportunities

NRI has been giving ambitious people new electronic skills since 1914. Today's offerings also include TV/Audio/Video Systems servicing with training on our exclusive Heath/Zenith computer-programmable 25" diagonal color TV…Industrial Electronics, Design Technology…and other state-of-the-art courses.

Free Catalog…Mail Card No Salesman Will Call

Send the postage-paid card for our 100-page catalog showing all courses with equipment and complete lesson plans. There's no obligation other than to yourself. See how NRI can help you grow with the most exciting and important new field of the 80's. If card has been removed, please write to us.

NRI Schools
McGraw-Hill Continuing
Education Center
3939 Wisconsin Ave.
Washington, DC 20016

We'll give you tomorrow.

Space Quarks for Broderbund). The execution is topnotch, the colors are bright, the three segments of the scenario are all well done. It simply isn't my cuppa.

The scenario is this: you are a modern-day trainrobber.

You must drive around a trainyard avoiding the onslaughts of a fierce phantom watchman who roars around in a green '52 DeSoto shaped like a lozenge.

A freight train, loaded with gold, tootles through the yard. Every time you crash through the wall of a freight car filled with gold it is transferred to your vehicle.

After you have liberated it, you must store the gold. It can be recovered by the DeSoto lozenge, but you can reliberate the loot by ramming into the phantom. This is the only time it is safe to do so.

creative computing

SOFTWARE PROFILE

Name: Track Attack

Type: Arcade activity

System: 48K Apple II or II+,
DOS 3.2 or 3.3 disk
drive; joystick optional;
soon available for the 32K
Atari 400/800

Format: Disk

Language: Assembly

Summary: The Fair Train Robbery

Price: $29.95

MAnufacturer:
Broderbund Software
1938 Fourth St.
San Rafael, CA 94901

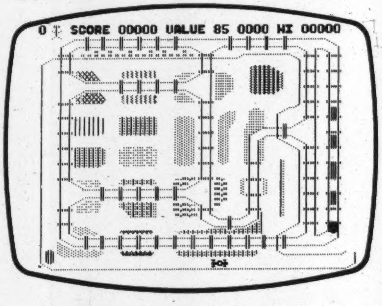
You can't run into the engine or any of the boxcars you have emptied. If you empty all four boxcars before the train refills, you earn another car.

You earn points for the gold and for restealing it from the phantom car, and the faster you are the better. You lose points if the phantom steals it, and more if it deposits the gold back to the train loading area.

Do you still follow me? There's no rest for the wicked yet.

The second level occurs after you have stolen at least one piece of gold. As you roll along the left side of the screen beside the train, you can press the space bar or joystick button. That makes your character leap onto the top of the train.

Next your little person must jump from car to car using the joystick, or the Z for downward tumble, A for upward jumps. If you miss, you go under the train, and lose a player and all the gold you have ripped off.



If you get into the engine, you move to level three of the game. Again avoiding the phantom (those '52 DeSotos must be real juggernauts), you direct the train around the tracks to pick up 11 pieces of gold. Each one worth all the gold you picked up at the first level.

Collect all 11 and you earn another extra character. Bang into the phantom, and there go all points from this level. Press the space bar or joystick button while the train is at the right side to return to the first level and back into your car.

If you notch your disk, you can save the high score to it. You can also turn off the sound, pause, change speeds, restart a game, and reconfigure your joystick or keyboard.

Track Attack is an unusual game requiring good reflexes. Try it; you might like it.

Apventure to Atlantis

Robert Clardy has been involved with Apples almost since the machine fell off

A sophisticated Z80™ based microcomputer training system.

Only $500.

THE FOX

The Fox is the most cost-effective and versatile microcomputer training system on the market today. At the heart of The Fox is a Z80 CPU, a chip which includes more capabilities than any other 8-bit microprocessor.

With a large memory capacity and sophistication found only in larger and more expensive units, The Fox is ideal for teaching microcomputer technology in schools, colleges and industrial training environments. Other features include extensive user prompting firmware, large digital readouts, power supply and exceptional versatility.

Compare The Fox with other low-cost microcomputers and you will agree that The Fox is the way to introduce microprocessing to your classroom, laboratory, office or home.

EDUCATORS! E&L also offers the MTP-80, a complete modular course in microcomputer technology which features The Fox.

Among the many features of The Fox are:

- Z80 CPU
- Low cost
- Large memory capacity
- Unlimited expansion with STD bus
- Serial and parallel I/O
- Large digital readouts
- Power supply included
- Solderless breadboarding area
- Stackable molded case with handle

Call or write for complete information or the name of your local E&L dealer/representative.

E&L Instruments Incorporated
61 First Street, Derby, CT 06418
(203) 735-8774 Telex 963536

CIRCLE 186 ON READER SERVICE CARD

Price applies in U.S. only and is subject to change without notice.

™Z80 is a trademark of Zilog, Inc.

the tree. He is one of the oldest members of the Apple Pugetsound Program Exchange Library (publisher of Call-A.P.P.L.E.), and is treasurer for the group.

He wrote *Higher Graphics* in 1979. *Odyssey* in 1980 (using Integer Basic) and recently rewrote it in Applesoft. His latest adventure, *Atlantis*, includes real-time arcade action...and it works.

Clardy's *Odyssey* was one of the early text adventures with the added grace of limited animation. *Atlantis* is a much more involved follow-up to Odyssey. It is a standalone game, however.

You begin the game by rolling the following attributes: wisdom, intelligence, strength, and charisma. When I say rolling, I don't mean with dice. Instead, a graphic onscreen scrolls at high speed through the numbers 8-18 for each attribute.

Press any key to stop the roll. You do that for each attribute, and when you are satisfied with them all, you move on. If you aren't satisfied, you begin again.

You also select your alignment and your reaction time.

Alignment lets you decide whether your character is chaotic, lawful, or some thing in between. In cowboy novel terms, the chaotic characters are the loners, while lawful folks make up the posse. If you try to assemble a group of opposed alignment, your morale will be down and you will have problems.

creative computing

SOFTWARE PROFILE

Name: Apventure to Atlantis

Type: Graphic adventure with arcade action

System: 48K Apple II or II+, DOS 3.3 disk drive; paddles optional

Format: Disk

Language: Machine

Summary: Multiventure from a master

Price: $40

Manufacturer:
Synergistic Software
5221 120th Ave. S.E.
Bellevue, WA 98006

As for reaction time, in the arcade sequences of the game this dictates how much time you have to cope with whatever creature menaces you. If you select 0, you have a straight adventure: nothing attacks or shoots at you. Select 9, and your name had best be Wild Bill Hickok II.

Your trip begins on the island of Lapour, where the orb of power of The High One was lost. You find the orb, and must build a group of trusted comrades—guards and wizards—to destroy the island of Atlantis.

The guards can be summoned. The wizards must be wooed with promises.

Your view of Lapour is from above. You control the direction of your character's travel, and watch him or her encounter—and perhaps combat—various beasts, from androids and orcs to great apes, ghouls, and land squids. You decide whether to fight or run, then press a key to stop the roll of numbers.

These battles increase your experience, and you can always replace fighters at the castle. Your character will also meet sorcerers' apprentices who can be persuaded to join the quest.

Ornithopters regularly visit the planet from Atlantis to drop off more monsters. If you read your 26-page book of instructions carefully, you will uncover a way to hijack one.

When you are underway, you can select weapons to determine your firepower. Among these are crossbows and guns, plus an assortment of attack spells (if you have any).

Your adversaries in this aerial competition might include submarines you can

1. What in the world is a Waldo?

Play

PEST PATROL

and the answer will come to you!

Are you prepared for an all out war, man vs. bug style? In this fast-action arcade game, you must defend yourself against a barrage of flying, slithering and crawling bugs! Armed with a generous supply of deadly insecticide, you must either take the aggressive or get squished like a common you-know-what. PEST PATROL, by Mark Allen, is biodegradable and won't harm the environment. Available from your local computer store for $29.95 or order directly from SIERRA ON-LINE.

Available on APPLE

SIERRAVISION

Sierra ON-LINE INC

36575 MUDGE RANCH ROAD COARSEGOLD, CA 93614
TLX 910 362 5025 209 683 6858

2. Where is it possible to go while seated on the back of a flying horse?

Find out when you play

ULYSSES

and the Golden Fleece

This game features everything you look for in a good vacation . . . travel, the opportunity to meet new people, and adventure, all in beautiful 21 color Hi Res graphics. Are you the stuff legends are made of? Find out by playing ULYSSES and the GOLDEN FLEECE. Available from your local computer store for $34.95 or order directly from SIERRA ON-LINE.

Available on APPLE, ATARI, and IBM

SIERRAVENTURE

Sierra ON-LINE INC

36575 MUDGE RANCH ROAD COARSEGOLD, CA 93614
TLX 910 362 5025 209 683 6858

CHRISTMAS SEASON SPECIALS!

Let ARK COMPUTING Make This Your Best Christmas Ever!

Super Fan II by R.H. Electronics **59.95/79.95**

Applicard, a high performance Z-80 card with 64K Ram, complete with CP/M
4 mhz **324.95**/445.00
6 mhz **395.00**/595.00

Microsoft Z-80 card with CP/M and Microsoft Basic
2 mhz **269.95**/395.00

Microtek Parallel Printer Interface complete with centronic compatible connector
64.95/79.95

Lazer Lower Case +Plus with Character Set +Plus **49.95**/84.90
Lower Case +Plus alone **39.95**/59.95

Lazer Graphics +Plus **99.95**/159.95
Graphics +Plus and Lower Case +Plus **134.95**/219.90

Computer Stop 16K Ram Board **69.95**/149.95

Computer Stop Omnivision 80 Column board
129.95/295.00

Videx Video-term with softswitch, inverse character set and 80 column Visicalc preboot
295.00/450.00

Wizard BPO 16K buffered printer interface (expandable to 32K) **134.95**/179.95

Wizard 80, 80 column board **195.00**/295.00

Lazer Pascal **29.95**/39.95

Anix 1.0 **34.95**/49.95

Lazer Forth **44.95**/59.95

D Tack 68000 board for the Apple II with 4K Ram **895.00**

Lazer Model/32 (16032 board for the Apple II)
CALL!

CIRCLE 116 ON READER SERVICE CARD

Lisa	**59.95**/79.95
Lisa Educational Pak	**79.95**/119.95
Alien Ambush	**19.95**/29.95
Bandits	**19.95**/29.95
Cannonball Blitz	**24.95**/34.95
County Fair	**19.95**/29.95
Cranston Manor	**24.95**/34.95
Cyclod	**19.95**/29.95
David's Midnight Magic	**24.95**/34.95
Dosource 3.3	**24.95**/39.95
Dueling Digits	**19.95**/29.95
Falcons	**21.95**/29.95
Firebird	**21.95**/29.95
Foosball	**19.95**/29.95
Horizon V	**25.95**/34.95
Genetic Drift	**19.95**/29.95
Kabul Spy	**24.95**/34.95
Jelly Fish	**19.95**/29.95
Lemmings	**19.95**/29.95
Labyrinth	**19.95**/29.95
Mouskattack	**24.95**/34.95
Outpost	**19.95**/29.95
Red Alert	**19.95**/29.95
Pig Pen	**24.95**/34.95
Russki Duck	**25.95**/34.95
Minator	**24.95**/34.95
Track Attack	**19.95**/29.95
Thief	**17.95**/29.95
Space Quarks	**19.95**/29.95
Snack Attack	**19.95**/29.95
Swash Buckler	**24.95**/34.95
Gin Rummy	**24.95**/34.95
The Dictionary	**69.95**/99.95
General Manager	**99.95**/149.95
4 Ft. Disk Cable	**19.95**/29.95
Visicalc	**179.95**/250.00
Using 6502 Assembly Language Book	**14.95**/19.95
Kids and The Apple Computer Book	**15.95**/19.95
Apple Panic	**19.95**/29.95
Kraft Joystick	**49.95**/69.95

ARK COMPUTING INC.

Your Salvation In The Sea Of Inflation.

714 735-2250
P.O. Box 2025
Corona, CA 91720

bomb; other ornithopters; Atlantean two-man scout ships; dragons; flocks of gargoyles, harpies, and rocks; air squid, green skulls; dark demons; and warlocks.

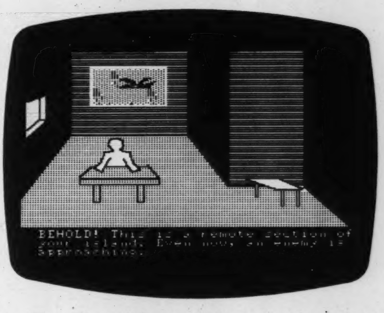
Once the enemy appears, you can aim with either the arrow keys or paddle 0. A crosshair appears near your vessel, and enables you to aim. Since your range is limited, you must wait until the enemy is right next to you.

Should you be successful in these forays, you must adjust the heading of your ship according to the prevailing winds, your velocity, amount of fuel, etc. You can adjust your altitude, and when you are comfortable, you can land to refuel.

This is an island world. Once you land on an outcropping, you find deserted castles. Denizens lurk within, but so do the fuel, weapons, and other reinforcement you need to destroy Atlantis.

As you travel from room to room in these castles, you can have either a wizard or a guard at your head. This means there will be either one or the other on the graphic.

The graphics are simple, but quick. They appear onscreen in a second, perhaps because there is little color.



```
BEHOLD! This is a remote section of
your island. Even now, an enemy is
approaching.
```

Should a vicious trog appear, you can aim your weapon (arrows are easier to recover than magic spells) and fire. The arrow from the crossbow will transfix it—if you have aimed correctly.

Don't take any potshots at the wizards that appear from time to time. You may be able to bring them to your side if your charisma is high enough. At times, they will get into wizard's duels with your henchpeople.

There are notes, hidden and/or magical objects and doors, and enough puzzles to satisfy the most ardent adventure fan. It might be possible for a person to play through in four or five hours, but it would take dedication.

Unlike most of the other adventure games on the market, *Atlantis* isn't linear. That is, you aren't forced to follow the steps in a certain sequence. Different things depending upon which you choose to explore (although the same rooms appear in each scene).

Once you have completed the game and destroyed Atlantis, everything changes. The rooms shift, random factors are adjusted, and nothing is as it was. You can also increase the speed of the reactions of the attackers.

Commands are mainly one-letter, such as U for "use some object." You can turn off the sound, and save the game until later.

The game has sound, color, animation, excitement, and—for when you're really stuck—a hint sheet. If you find static adventures boring, try this one.

Knight of Diamonds

Wizardry left many of its fans panting for more. Their impatience for a new scenario has been rewarded with *Knight of Diamonds* (KOD).

One player, I am told, completed the quest within a week or so. I wonder why? What fun is there in racing through such a complex and challenging program? Particularly when slow, thorough exploration will bring characters up several

3. How long was this product on the top thirty?

WIZARD AND THE PRINCESS

This adventure game holds an all time record for its long held position on the Softalk top thirty. Once you play the game, you will understand why. WIZARD & THE PRINCESS features some of the most challenging and imaginative puzzles in all adventure-dom and has stumped players all over the world! You can't call yourself a master adventurer until you've played WIZARD & THE PRINCESS. Available from your local computer store for $32.95 or order directly from SIERRA ON-LINE.

Available on APPLE and ATARI

SIERRAVENTURE

Sierra ON-LINE INC

36575 MUDGE RANCH ROAD COARSEGOLD, CA 93614
TLX 910 362 5025 209 683 6858

4. What valuables await the wise detective in this classic adventure game?

MYSTERY HOUSE

The mention of mystery brings up images of huge old victorian houses, trap doors, narrow escapes and — most of all — MURDER!!!
Over two years ago, a tantalizing adventure was released that combined all of these images and made them hotter through the use of HI-RES GRAPHICS. Now, that adventure has been made bigger because the original authors and Bob Davis (creator of ULYSSES and the GOLDEN FLEECE) have added new puzzles and pleasures to that game, made better through the use of 21 color Hi-Res Graphics to really make the adventure come to life. What treasure awaits you if you solve the mystery? Find out by playing MYSTERY HOUSE, available from your local computer store for $29.95 or order directly from SIERRA ON-LINE.

Available on APPLE

SIERRAVENTURE

Sierra ON-LINE INC

36575 MUDGE RANCH ROAD COARSEGOLD, CA 93614
TLX 910 362 5025 209 683 6858

Apple* ★ Atari* ★ Commodore*
Franklin* ★ IBM* ★ TRS-80*

Krell's College Board

SAT*
Preparation Series

New for '83

A COMPREHENSIVE PREPARATION PACKAGE / MORE THAN 40 PROGRAMS

1. Diagnostic analysis
2. Prescription of individual study plans
3. Coverage of all SAT* skills
4. Unlimited drill and practice
5. SAT* Exam Question simulator
6. All questions in SAT* format and at SAT* difficulty level
7. Instantaneous answers, explanations and scoring for problems
8. Worksheet generation and performance monitoring - (optional)
9. A complete record management system-(optional)
10. Systematic instruction in pertinent math, verbal & test taking skills - (optional)

Krell's unique logical design provides personalized instruction for each student according to individual needs.

Krell's College Board SAT* 81/82 Prep. Series has demonstrated a mean combined math and verbal score increase of more than 100 points by using sophisticated drill & practice techniques alone. This new series is much expanded and updated. In addition extra cost options are now available to provide worksheet generation, record management, and systematic instruction in all math and verbal areas tested by the SAT*.

All versions of Krell College Board SAT* Preparation Series provide answers, explanations and instantaneous raw scoring. Standard package $299.95

APPLE, ATARI, COMMODORE, CP/M, IBM, AND RADIO SHACK*

SWORD OF ZEDEK

Fight to overthrow Ra, The Master of Evil. Treachery. deceit, and witchcraft must be faced in your struggles as you encounter wolves, dwarves, elves, dragons, etc. Each of the twelve treasures will enhance your power by making you invisible, invulnerable, etc. Each game is unique in this spectacular and complex world of fantasy. $24.95

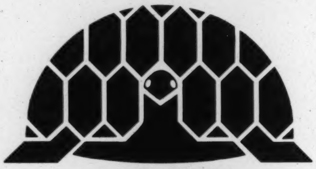
LOGO
©M.I.T. 1981

$99
NO FRILLS for Apple II®

NO FRILLS PAK

1. Two copies of Krells LOGO for Apple II*
2. Utility Disk with M.I.T.'s valuable demo programs including Dynatrack
3. The official M.I.T technical manual LOGO FOR APPLE II by H. Abelson & L. Klotz

No Frills Turtle Price $99.00



LOGO
FRILLS ONLY

FRILLS FOR LOGO / Support Pak for: M.I.T. LOGO, KRELL & TERRAPIN INC.

1. Krell utility disk
2. Alice in LOGOLAND
3. LOGO for Apple II - by H. Abelson
4. Alice in Logoland Primer
5. Comprehensive wall chart
6. LOGO & Educational Computing Journal

$89.95

NO FRILLS LOGO AND ALL THE FRILLS COMBO FOR APPLE II* $149.95

SPRITES NOW AVAILABLE FOR LOGO Call for information

Prices slightly higher outside U.S.

TIME TRAVELER

Using the Time Machine, players must face a challenging series of environments that include: The Athens of Pericles, Imperial Rome, Nebuchadnezzar's Babylon, Ikhnaton's Egypt, Jerusalem at the time of the crucifixion, The Crusades, Machiavelli's Italy, the French Revolution, the American Revolution, and the English Civil War. Deal with Hitler's Third Reich, Vikings, etc. Players may set level of difficulty. Each game is unique. $24.95

Shelby Lyman Chess*

Shelby's Socrates Chess Tutorial Series uses the latest AI techniques to customize each lesson for you. Instruction modules cover every aspect of the game. For all micro's. Call or write for details.

Amazing Ben
The Royal Road to Artificial Intelligence.
$79.95

Connections

A complete game system. Learn the principles of scientific reasoning in your choice of game formats. Expand minds at all ages. Subject areas include: Geography, Biology, Everyday Objects, etc.

Game System $99.95

Data Base, $24.95 per subject, 3 for $50

Isaac Newton + F.G. Newton

Perhaps the most fascinating and valuable educational game ever devised - ISAAC NEWTON challenges the players to assemble evidence and discern the underlying "Laws of Nature". FULL GRAPHICS NEWTON - presents all data in graphic form. This game is suitable for children. Players may select difficulty levels challenging to the most skilled adults. Both Games $49.95

Pythagoras and the Dragon

Mathematics in a fantasy game context. Based on THE SWORD OF ZEDEK introduces Pythagoras as a mentor to the player when called on for aid, Pythagoras poses math questions and depending on the speed and accuracy of response, confers secret information. With Pythagoras as an ally, the quest to overthrow Ra, The Master of Evil, assumes a new dimension of complexity. Depending on the level chosen problems range from arithmetic through plane geometry. APPLE, TRS-80, PET, ATARI* 32K $39.95

KRELL®
SOFTWARE CORR
The state of the art in educational computing
1320 Stony Brook Road / Stony Brook NY 11790
Telephone 516-751-5139

Krell Software Corp. has no official ties with the College Entrance Examination Board or the Educational Testing Service Krell is, however, a supplier of products to the E T S

*Trademarks of Apple Comp. Corp., Tandy Corp., Commodore Corp Digital Research Corp., I B M., Atari Corp Terrapin Inc
Socrates Chess Corp.

VISA N.Y.S residants add sales tax

CIRCLE 216 ON READER SERVICE CARD

levels before they venture deeper into the dungeon.

The scenario in this game is for characters who have advanced through the ranks in *Wizardry* (minimum of 13th level). Bishops, fighters, mages, lords, ninjas, thieves, and other classes must be experienced to survive.

creative computing

SOFTWARE PROFILE

Name: Knight of Diamonds

Type: Top-of-the-line fantasy adventure

System: 48K Apple II or II+, DOS 3.3 disk drive

Format: Disk

Language: Run-time Pascal (no special equipment needed)

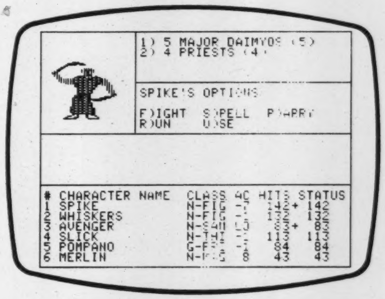
Summary: Deeper dungeons for your alter egos

Price: $34.95

Manufacturer:
Sir-Tech Software, Inc.
6 Main St.
Ogdensburg, NY 13669

You cannot create characters in this game. You can use only experienced characters from The Proving Grounds. (This is a bit inconvenient when you want to begin a new sacrificial lamb or storage unit.)

Here, too, is a quest, its goal the staff of Gnilda, which projects a totally impervious force field that protects the City of Llylgamyn. Neither magic nor physical attack has been able to penetrate the field.



```
1) 5 MAJOR DAIMYOS (5)
2) 4 PRIESTS (4)

SPIKE'S OPTIONS

F)IGHT   S)PELL   P)ARRY
R)UN     U)SE

# CHARACTER NAME  CLASS AC HITS STATUS
1 SPIKE           N-FIG -7  142+ 142
2 WHISKERS        N-FIG -1  132  132
3 AVENGER         N-SAM LO   83+  83
4 SLICK           N-THI -2  113  113
5 POMPANO         G-F[illegible] -1   84   84
6 MERLIN          N-[illegible]  8   43   43
```

Through treachery it was manipulated by an evil wizard, Davalpus, to seize the throne and slay the royal family of Llylgamyn. Wearing the armor of the fabled Knight of Diamonds, a remaining young prince destroyed Davalpus only to die with him in the ruins of the castle.

Now, the armor must be gathered from the six terrible levels of the ruins and the staff found...or the city of Llylgamyn will fall.

Your quest begins in the city, where you find the familiar franchise operations: Gilgamesh's Tavern, Boltac's Trading Post, the HoJo's Adventurer's Inn, and the famous Temple of Cant.

The game uses the *Wizardry* system and graphics. Most commands are one-keystroke. You have direct control of each person in your party (as many as six). Only three characters can fight with weapons at one time, although magic-users can fire spells over the front line.

Monster groups are tough, and many of them are new species. Often, there are four groups of up to nine beasts per group. There are swarms of insects, wereprides of weretigers, clouds of fuzzballs, dwarf-like men called dinks, bats, snakes, and other vermin.

Even though the battles are much tougher, the treasures reflect this: they are more generous. Also, you garner more experience points during battle than in Proving Grounds.

Warning: the Magician General has

5. How would you get past a pink bull?

Find out when you play . . .

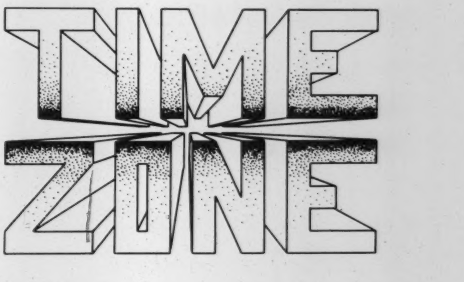
Cranston Manor

A Pink Bull? A haunted suit of Armor? A toy soldier with a real gun? Where else but Cranston Manor would you find challenge like this?
The estate of the "late" old Mr. Cranston is littered with rare, priceless art, perilous traps and puzzling problems for you to solve. Be forewarned . . . a (k)night in CRANSTON MANOR is a night you won't forget. Available from your local computer store for $34.95 or order directly from SIERRA ON-LINE.

Available on APPLE

SIERRAVENTURE Sierra ON-LINE INC
36575 MUDGE RANCH ROAD COARSEGOLD, CA 93614
TLX 910 362 5025 209 683 6858

6. How big is



Everyone knows by now that TIME ZONE is the biggest adventure game in history, but how many disks does it take just to hold the actual TIME ZONE program? How many disks does it take to hold an adventure that features over 1200 Hi-Res color pictures and covers all of time? How big is the end product of a project that took the likes of Ken and Roberta Williams, Bob Davis, and Jeff Stephenson over a year to develop?
Play the first ever micro-epic, TIME ZONE, and make a little history of your own. Available from your local computer store for $99.95 or order directly from SIERRA ON-LINE.

Available on APPLE

SIERRAVENTURE Sierra ON-LINE INC
36575 MUDGE RANCH ROAD COARSEGOLD, CA 93614
TLX 910 362 5025 209 683 6858

BE CHALLENGED

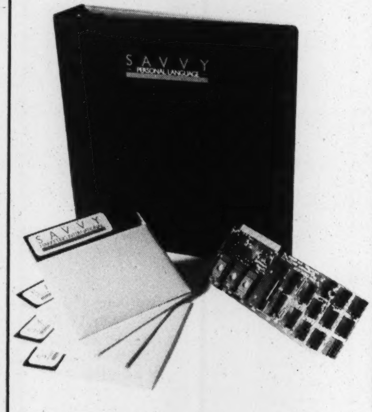
If you are a talented micro computer specialist, you follow the field closely, you know what's been done and what's expected. —

But you've never seen anything like

SAVVY™

Nobody has.

- A CO-PROCESSOR for the Apple II, with 64-Megabyte Associative Memory, 26 Decimal Digits of Precision, and Hardware Security.
- AN OPERATING SYSTEM that automatically Loads, Links, Overlays, and Executes Application Programs.
- A DATABASE MANAGER that automatically Blocks, Allocates, Opens, and Closes Data Sets.
- MACHINE INTELLIGENCE that automatically Resolves: Program Names, Item Names, Data Types, File Structures, Folder Names, and Instructions to the Robot Programmer™.
- A COMPILER that Produces Self-Loading, Self-Relocating, Serially Reusable Code.
- A PROGRAMMING LANGUAGE that uses Plain-tex Language and Machine Intelligence.
- AN ASSOCIATIVE NETWORK in which Machine Intelligence, Operating System, Compiler, Database Manager, Programming Language, and Application Programs are all interconnected in the 64-Meg Associative Memory.



Even the developers of this technology haven't seen the end of the possibilities. Accept the challenge of working with SAVVY, and it can become whatever you make it.

Your innovative applications that explore the power of SAVVY will be used in future publicized promotions, with credit given to the developer.

To own SAVVY for $950.00 contact your local Apple dealer.

To accept the challenge, contact Excalibur, the developers of SAVVY, for detailed information on this remarkable system.

Excalibur Technologies Corp.
Albuquerque, New Mexico
(505) 242-3333

SAVVY Marketing International markets and distributes SAVVY the Personal Language™ System.

TM - SAVVY, Robot Programmer: Excalibur Technologies Corp.

TM - Personal Language is a trademark of SAVVY Marketing International.

Excalibur
TECHNOLOGIES CORPORATION

CIRCLE 365 ON READER SERVICE CARD

determined many of these are dangerous and should be used at your character's risk.

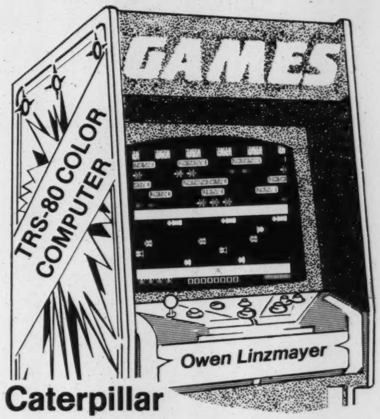
Characters can be drained of levels by some creatures (undead, for the most part) more than once. If you have a good character who is drained, turn the machine off immediately before the damage is recorded. (You will also lose all points and magic items discovered on that particular expedition. You won't, however, be charged 10 years on this new version.)

If you do turn off the machine it is possible that the important pieces of *KOD* armor found on that expedition—or traded after you form a party—could be lost if you go back to the training grounds before you go below. So don't flip the switch indiscriminately.

Some spells work differently in *KOD* than they do in Proving Grounds. One new feature is that no one in either the player's party or the enemy group can throw spells for the first melee of a surprise attack.

Author Robert Woodhead said about this new game: "Things are not always what they seem." He also feels that the riddle on the sixth level is "a real killer" even though he thinks the answer is very obvious.

Altogether, now that the initial bugs have been exterminated, this game is a worthy sequel to *Wizardry*.



Caterpillar

Atari struck it rich last year when they introduced the coin-op video game Centipede. It was, for the most part, a high-speed shoot 'em up with cute graphics that appealed to men and women alike. Not surprisingly, the arcade Centipede was soon followed by home computer versions. *Caterpillar*, from Aardvark Software is one of the best adaptations of the original arcade game.

Caterpillar is a fast paced game written in machine language. It supports only one player using the right joystick. In the game, you have three shooters with which you must destroy an onslaught of attacking insects.

Your base is situated at the bottom of a mushroom patch. A large caterpillar starts off at the top of the patch. Each time a segment runs into a mushroom, it drops down a level and reverses direction. Shooting a caterpillar segment turns it into a mushroom and causes the creature to split in two.

In addition to the caterpillars; spiders, fleas, and scorpions also infest the mushroom patch. If your shooter collides with any insect, it is destroyed.

Caterpillar plays very much like Centipede, with a few exceptions. Your shooter

creative computing
SOFTWARE PROFILE

Name: Caterpillar
Type: Arcade
System: TRS-80 Color Computer 16K
Format: Cassette/disk
Language: Machine
Summary: Playable game of Centipede
Price: $19.95 cassette, $21.95 disk
Manufacturer:
Aardvark Software
2352 S. Commerce
Walled Lake, MI 48088

7. What can be on level three that can help you to the top of the hill in a hurry?

in

Cannonball Blitz

As a little soldier in CANNONBALL BLITZ you've run your legs off to scurry up two screens full of uphill battle. What leg saving device will you find on the third screen to get you up the hill in a hurry?
Find out when you play CANNONBALL BLITZ but watch out!! Fast, smooth animation and escalating levels make this game potentially addicting. Available from your local computer store for $34.95 or order directly from SIERRA ON-LINE.

Available on APPLE

SIERRAVISION

Sierra ON-LINE INC

36575 MUDGE RANCH ROAD COARSEGOLD, CA 93614
TLX 910 362 5025 209 683 6858

8. How many times can a monster be reincarnated?

Play

CROSSFIRE

You will swear you didn't miss and you'll be right. The aliens are coming from everywhere and to eliminate one, you must hit it several times. With each hit, the monster gets uglier and meaner. How many times do you have to hit the advancing alien before he stops his attack? Find out when you play CROSSFIRE. Available from your local computer store for $29.95 or order directly from SIERRA ON-LINE.

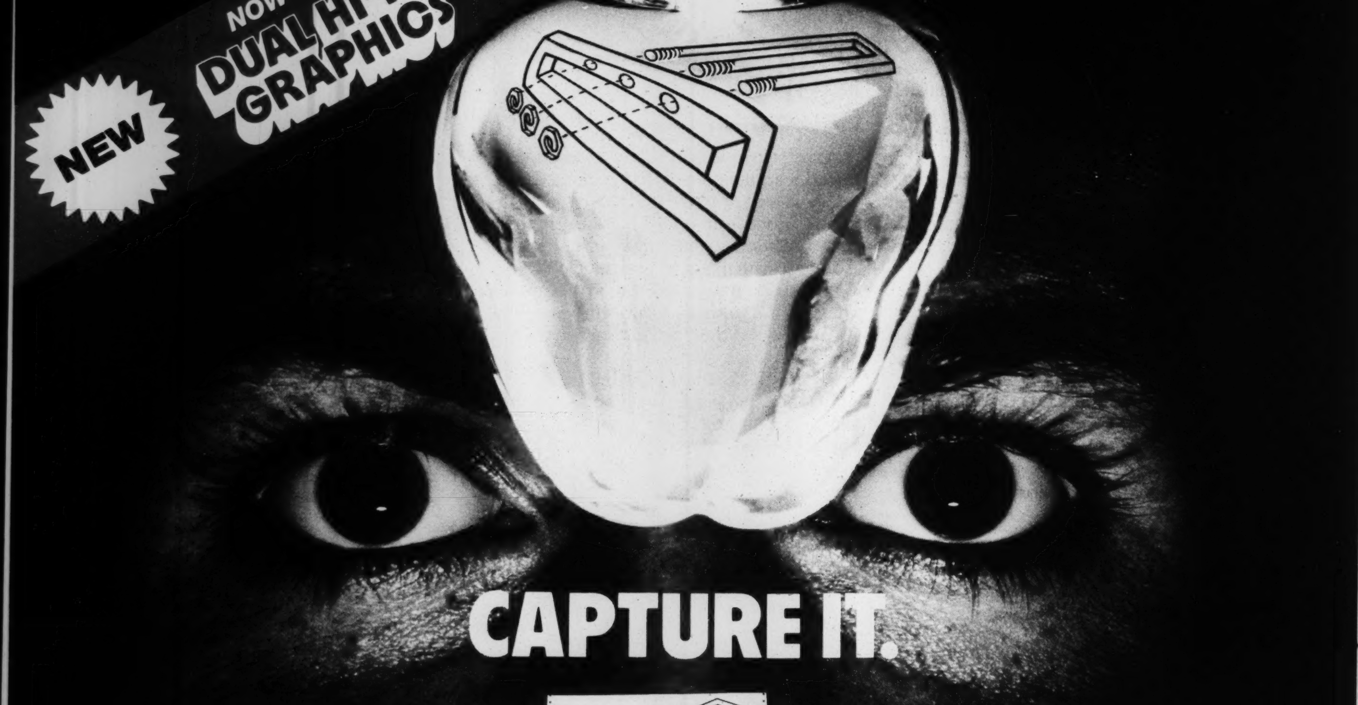
Available on APPLE, ATARI, IBM, and NEC

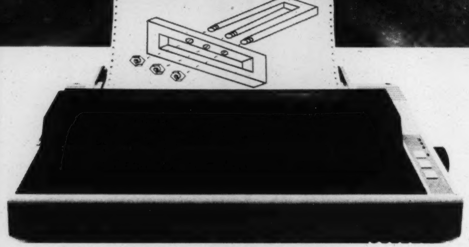
SIERRAVISION

Sierra ON-LINE INC

36575 MUDGE RANCH ROAD COARSEGOLD, CA 93614
TLX 910 362 5025 209 683 6858

IMAGINE IT...





ACTUAL APPLE II PRINTOUT USING GRAPPLER AND EPSON MX100

With The Grappler+™ Printer Interface

Grappler +
Orange Micro

Completely Redesigned. Now, the Grappler+.
The original Grappler was the first graphics interface to give you hi-res screen dumps from your keyboard. The new Grappler+ with *Dual Hi-Res Graphics* adds flexibility with a side-by-side printout of page 1 and page 2 graphics.

Interfacing the Grappler+ to a wide range of printers is easy as changing a dip switch. 4K of exclusive firmware makes the Grappler+ the most intelligent, full-featured Apple® Printer Interface made. And, the Grappler+ is Apple III compatible.*

The imitations are many, so insist on the #1 Apple Graphics Interface on the market. Insist on the Grappler+. Available now at most Apple dealers.

*Requires additional software driver.
**Requires graphics upgrade.

©Orange Micro, Inc. 1982

CIRCLE 261 ON READER SERVICE CARD

The Grappler+ Features:
• Dual Hi-Res Graphics • Printer Selector Dip Switch • Apple III Compatible* • Graphics Screen Dump • Inverse Graphics • Emphasized Graphics • Double Size Picture • 90° Rotation • Center Graphics • Chart Recorder Mode • Block Graphics • Bell Control • Skip-over-perf • Left and Right Margins • Variable Line Length • Text Screen Dumps.

The Grappler+ also works with Pascal and CPM.

The Grappler+ Interfaces with the following printers:
• Anadex • Centronics • Datasouth • Epson** • NEC • C-Itoh • Okidata**

The original Grappler is available for IDS 460, 560, Prism, Microprism.

Orange Micro Inc.

3150 E. La Palma, Suite G
Anaheim, California 92806
(714) 630-3620

Foreign Dealer Inquiries Welcome TX183511 CSMA

CPM is a registered trademark of Digital Research, Inc.
Apple is a registered trademark of Apple Computer, Inc.

is over-responsive to the joystick controls. Simply pressing the joystick to the left causes your shooter to jump almost instantaneously all the way to the left side of the screen. Scoring in *Caterpillar* is almost identical to that in Centipede.

The graphics in *Caterpillar* are hi-res, although they really don't look it. There are many colors and shapes, but unfortunately they appear very blocky. The screen colors don't change after every wave of insects as they do in Centipede, but that doesn't affect game play. The movement of the caterpillar and other insects is very smooth; there is no flicker at all.

Caterpillar produces sound effects only when something is destroyed. Since it has been determined that almost 50% of the appeal of an arcade game is the audio effects, *Caterpillar* falls short in this area. Although it lacks enticing sound effects, the game does offer a great challange. It is very difficult to score over 20,000 points, and almost impossible to master the game.

I recommend *Caterpillar* to anyone who is more interested in game play than exciting graphics and sound effects.

Katerpillar

Wait a minute, didn't I just review this? Yes, and no. *Katerpillar* is pronounced the same as *Caterpillar* and they are both TRS-80 Color Computer adaptations of Centipede. The difference between the two programs is easy to explain. *Caterpillar* plays much more like the arcade game, and *Katerpillar* offers nicer graphics and more pleasing sound effects.

Since *Katerpillar* is modeled after Centipede, its description is similar to that of Caterpillar. Rather than rehash the basic information, let's discuss the program itself. After EXECuting *Katerpillar*, you are presented with a very professional banner page. After the program displays the scoring table, you play the game.

The graphics in *Katerpillar* are very crisp, hi-res shapes. The choice of colors is good and pleasing to the eye. As in *Caterpillar*, the insects move smoothly and don't flicker on and off.

Katerpillar is not a silent game; everyting you do is accompanied by sound effects.

I can find only two faults with *Katerpillar*. Sometimes the centipedes don't drop down as they are supposed to; they get caught in an endless loop until you shoot away one of the mushrooms upon which they continue to bounce. The other thing I didn't like about *Katerpillar* is that your shooter can move up and down only within two horizontal rows. This severely limits your movement and makes the game for two difficult.

If you enjoy Centipede, but like pretty colors and flashy programming, *Katerpillar* is better than *Caterpillar*. Unfortunately there is no program available that combines the playablility of one with the professionalism of the other; you must decide which is more important to you.

creative computing
SOFTWARE PROFILE

Name: Katerpillar
Type: Arcade
System: TRS-80 Color Computer 16K
Format: Cassette
Language: Machine
Summary: Professional adaptation of Centipede
Price: $24.95
Manufacturer:
Tom Mix Software
3424 College N.E.
Grand Rapids, MI 49505

---

9. What kind of a game can you make with

END GAME

END GAME is a fun, flexible, new way to create some of the best entertainment available for home computers. END GAME is the type of tool that Crowther/Woods would have used to create their game IF it had been available. END GAME is your way to write the game that you always knew existed in the back of your mind — but you never had the time and knowledge to program. END GAME is a useful utility for creating the type of game that many schools are using to promote computer literacy and analytical thinking. What is END GAME? Find out at your local software dealer or from SIERRA ON-LINE INC. Find out how much creative fun you can buy for $39.95.

Available on APPLE
SIERRAVENTURE
Sierra ON-LINE INC
36575 MUDGE RANCH ROAD COARSEGOLD, CA 93614
TLX 910 362 5025 209 683 6858

---

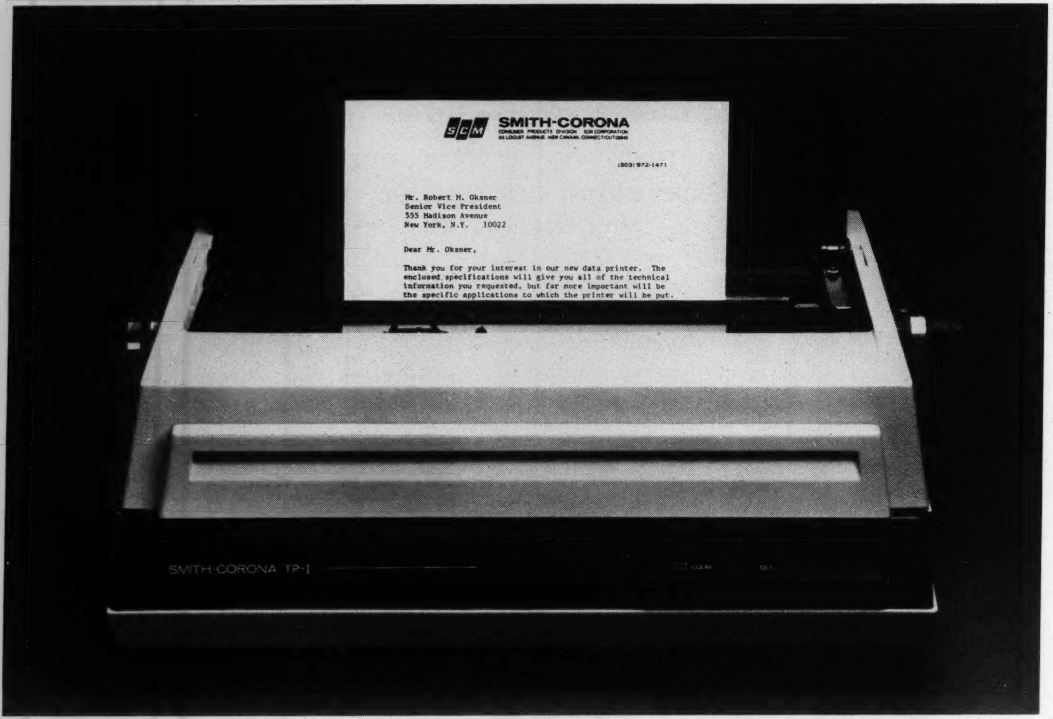
10. Which top Apple originator recommends

LISA 2.5

His friend Steven Jobs helped him develop the Apple II and LISA 2.5 helps him develop machine language programs for it.
LISA does the same for other top programmers including graphics wizard Mark Pelczarski, Hi-Res adventure author Ken Williams and arcade author Olaf Lubeck. LISA is an assembler in use by people that use them everyday. Take a look at LISA 2.5. We think you'll agree with the Apple inventor(—)? (we won't give you the name). LISA is available at your local computer store for $79.95 or order directly from SIERRA ON-LINE.

Available on APPLE
SIERRA BUSINESS PRODUCTS
Sierra ON-LINE INC
36575 MUDGE RANCH ROAD COARSEGOLD, CA 93614
TLX 910 362 5025 209 683 6858

The Smith-Corona TP-1 is the only letter-quality printer for under $900.* No wonder it's so popular!



SMITH-CORONA
CONSUMER PRODUCTS DIVISION SCM CORPORATION
65 LOCUST AVENUE, NEW CANAAN, CONNECTICUT 06840

(203) 972-1471

Mr. Robert M. Oksner
Senior Vice President
555 Madison Avenue
New York, N.Y. 10022

Dear Mr. Oksner,

Thank you for your interest in our new data printer. The enclosed specifications will give you all of the technical information you requested, but far more important will be the specific applications to which the printer will be put.

The Smith-Corona® TP-1™ Daisy Wheel Printer.

Big problem! You want to get a beautiful, letter-quality printer. Yet you want to keep costs down. Welcome solution: the Smith-Corona TP-1.

It's the only daisy wheel printer on the market that sells for under $900. So you can get the print quality you really want in a printer, at a price that's well within your budget. (In fact, it's so reasonable, you may find you want a TP-1 even if you already own a dot matrix.)

The TP-1 is just right for small businesses or in-home users. No wonder it's already a huge success!

The print quality of the TP-1 stands up against printers costing three times as much. In fact, you'll get results identical to those of the finest office typewriters. So you'll never again have to send an important letter that doesn't look important.

The TP-1 is also suitable for reports and manuscripts. Even budgets and forms.

Just as important, the TP-1 is amazingly simple to operate. And it's compatible with most microcomputers and available with either standard serial or parallel data interface.

The basic TP-1 handles letter and legal sized paper. A tractor feed option to handle either fanfold or single sheet paper will be available soon. There's a choice of easy-to-change, state-of-the-art daisy print wheels. And ribbon cassettes that just drop in —simple as that.

One other thing: unlike many printers, the Smith-Corona TP-1 is made in America.

So don't settle for a dot matrix printer when you can find (or add) real letter-quality results at an incredibly low price. With the Smith-Corona TP-1 daisy wheel printer.

Smith-Corona

Please send me information on the Smith-Corona TP-1 daisy wheel printer.

Name__________

Title__________

Company Name__________

☐ check if dealer

Business Address__________

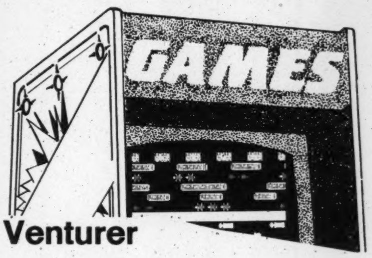
City_____ State_____ Zip_____

Mail coupon to:
Jerry Diener, Vice President Sales
Smith-Corona
65 Locust Avenue, New Canaan, Ct. 06840

CC-12

CIRCLE 315 ON READER SERVICE CARD

*Manufacturer's suggested retail is under $900, but prices may vary.



Venturer

Exidy's Venture video game was the first to use arcade game action in a fantasy role-playing scenario. The player, Winky, delves into treasure-filled rooms armed with only a bow and arrows. *Verturer*, from Aardvark Software, is a Color Computer program based on Venture.

Winky is a small, circular figure who has only one goal: to grab treasures while avoiding the monsters that guard them. In *Venturer*, there is one large room composed of four smaller sub-rooms. Each sub-room has one treasure in it. When Winky enters a room, a picture of the room, the treasure, the monsters, and Winky expands to fill the screen. The player must fight his way to the treasure, grab it, and quickly run from the room.

Players in *Venturer* use the right joystick to manuever Winky and aim arrows; the left joystick is used to pause the game if necessary. Pressing the button on the right joystick causes Winky to fire an arrow in the direction he is pointing. If the arrow hits a monster, it turns into a gravestone and after a while, disappears.

The sound effects in *Venturer* are very nice; better than in most Color Computer programs. *Venturer* is a machine language program that uses hi-res graphics. Unfortunately, the program does not use overlay routines that allow one shape to pass over another without destroying one of them. This could have been done differently and the effect would have been much more professional. As the program now stands, if one object passes over another, the one on the bottom is masked out.

creative computing

SOFTWARE PROFILE

Name: Venturer

Type: Fantasy/arcade

System: TRS-80 Color Computer 16K

Format: Cassette/disk

Language: Machine

Summary: Best Venture program on the market

Price: Cassette $19.95/disk $21.95

Manufacturer:
Aardvark Software
2352 S. Commerce
Walled Lake, MI 48088

There is on-screen scoring in *Venturer*, but no indication as to how many men you have left. You win free men at various point intervals.

Although the four rooms are always the same, the monster and treasure shapes differ at advanced levels. Unlike Venture, in *Venturer*, each room of a specific level contains the same treasures. After you have grabbed all four treasures, you advance to the next level where the treasures are different. The monsters and treasures are merely graphic shapes; they always act in the same manner, yet they appear to be different.

One difference between this program and the coin-op game is that instead of Hall Monsters coming into a room if you stay too long, barricades are built. A barricade starts at the top of the screen and slowly a line is drawn down. If you are caught on one side of a barricade and the door is on the other, there is no escape.

Venturer, although it doesn't offer the amount of variety found in the arcade game, is a well written Color Computer program. It plays like its coin-op cousin and is sure to please a variety of computer users.

---

11. What does E-P-F stand for?

EPF IV

Extra-Powerful FORTRAN? Easily programmed FORTH? The exact meaning of the initials is for you to define, but we can tell you that EPF IV makes programming easier.
EPF IV lets you use the power of the Apple to help you program by letting the Apple do work like keeping track of line numbers and maintaining files. It also offers a powerful Applesoft editor that provides functions like global search and delete, global replace, copy and move block of text and other functions that you currently use with your word processor. Cut out the redundancy of Applesoft code in your program and let the computer do the boring work for a change. Experience Programming Fun. Check out EPF IV. Available now at your local computer store for$79.95 or order directly from SIERRAON-LINE.

Available on APPLE

SIERRA BUSINESS PRODUCTS

Sierra ON-LINE INC

36575 MUDGE RANCH ROAD COARSEGOLD, CA 93614
TLX 910 362 5025 209 683 6858

12. What popular office furnishing is threatened with extinction because of the 2.0 release of

THE GENERAL MANAGER

They are being replaced and recycled all over America — as more people learn about the computerized filing system that works for you not vice-versa. The GENERAL MANAGER lets you set up the same filing system on your Apple that you currently have stored in your outdated office product — but now the system works for you! All the information in your filing system suddenly comes together so you get facts and files that you need — FAST!! GENERAL MANAGER 2.0 is easily customized and comes with complete easy-to-read documentation. GENERAL MANAGER is making office furniture obsolete at local computer stores everywhere or by ordering directly from SIERRA ON-LINE.

Available on APPLE

SIERRA BUSINESS PRODUCTS

Sierra ON-LINE INC

36575 MUDGE RANCH ROAD COARSEGOLD, CA 93614
TLX 910 362 5025 209 683 6858

GEMINI–
FOR PRINTER VALUE THAT'S OUT OF THIS WORLD

Over thirty years of down-to-earth experience as a precision parts manufacturer has enabled Star to produce the Gemini series of dot matrix printers—a stellar combination of printer quality, flexibility, and reliability. And for a list price of nearly 25% less than the best selling competitor.

The Gemini 10 has a 10″ carriage and the Gemini 15 a 15½″ carriage. Plus, the Gemini 15 has the added capability of a bottom paper feed. In both models, Gemini quality means a print speed of 100 cps, high-resolution bit image and block graphics, and extra fast forms feed.

Gemini's flexibility is embodied in its diverse specialized printing capabilities such as super/sub script, underlining, backspacing, double strike mode and emphasized print mode. Another extraordinary standard feature is a 4k buffer (with an additional 4k on the serial board). That's twice the memory of leading, comparable printers. And Gemini is compatible with most software packages that support the leading printers.

Gemini reliability is more than just a promise. It's as concrete as a 180 day warranty (90 days for ribbon and print head), a mean time between failure rate of 5 million lines, a print head life of more than 1 million characters, and a 100% duty cycle that allows the Gemini to print continuously. Plus, prompt, nationwide service is readily available.

So if you're looking for an incredibly high-quality, low-cost printer that's out of this world, look to the manufacturer with its feet on the ground—Star and the Gemini 10, Gemini 15 dot matrix printers.

star
micronics • inc

MAKING A NAME FOR OURSELVES

1120 Empire Central Place, Suite 216, Dallas, TX 75247
For more information, please call Bob Hazzard, Vice President, at (214) 631-8560.
CIRCLE 336 ON READER SERVICE CARD

Galax Attax

Spectral Associates was one of the first software firms to produce games exclusively for the Color Computer. *Galax Attax* is their licensed version of Midway's popular Galaxian arcade game.

Like most arcade games for the Color Computer, *Galax Attax* is a one player game. As in Galaxian, you have three laser bases located on the bottom of the screen. A convoy of invaders looms overhead. Occasionally, individual aliens break out of formation and attack your ship. Shooting attacking aliens is worth more than killing them while they are in the convoy.

You move your ship across the bottom using the right joystick. Pressing the button fires one laser shot into the air. Your ship seems to hop along the screen rather than slide across as you would expect it to. It is hard to control the movement of your ship accurately.

Galax Attax boasts one of the most colorful hi-res playscreens I have seen on the Color Computer. The small stars in the background slowly scroll, given the illusion of three dimensions. The alien movements are fluid, not jumpy.

There is a graphic representation of the number of ships left and a running total score. The game itself is challenging and fun to play. The sound effects are never ending. In addition to the sounds of explosions, diving ships, and laser bursts, there is always the droning noise from the engines. All in all, *Galax Attax* is a very enjoyable game--which remains true at all times to its parent, Galaxian.

creative computing
SOFTWARE PROFILE

Name: Galax Attax
Type: Arcade
System: TRS-80 Color Computer 16K
Format: Cassette
Language: Machine
Summary: Licensed version of Galaxian
Price: $21.95
Manufacturer:
Spectral Associates
141 Harvard
Tacoma, WA 98466

Berserk

In the arcades, Stern's Berzerk game has a large following. When Atari released their home VCS version of Berzerk back in August, the demand for the game almost cleared the shelves. Not surprisingly, Color Computer owners also want to enjoy the thrill of Berzerk--luckily, there is *Berserk* from Mark Data Products.

In *Berserk*, you play a human trapped in a maze complex. Killer robots have been unleashed to see that you do not escape. You must destroy robots by

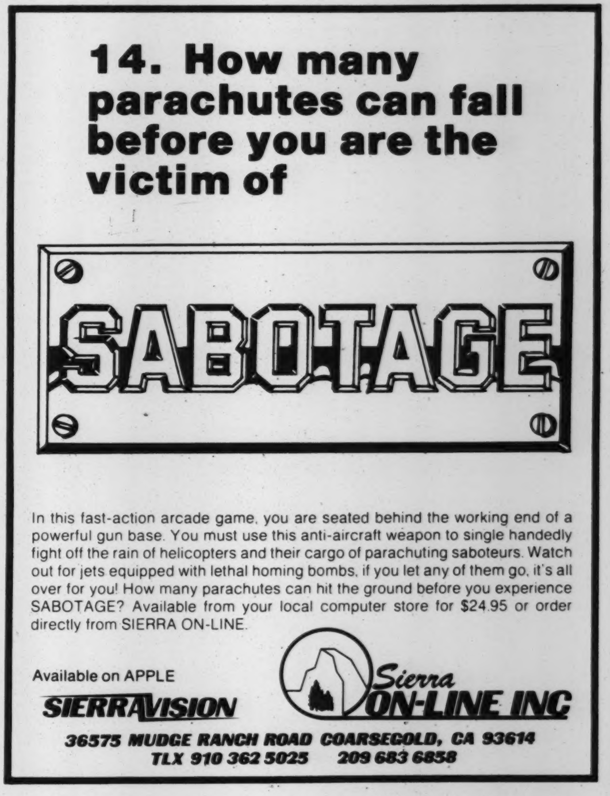
creative computing
SOFTWARE PROFILE

Name: Berserk
Type: Arcade
System: TRS-80 Color Computer 16K
Format: Cassette/disk
Language: Machine
Summary: Adapation of Berzerk
Price: $24.95/$29.95
Manufacturer:
Mark Data Products
23802 Barquilla
Mission Viejo, CA 92691

13. What free health service does the popular arcade game JAWBREAKER have to offer?

Imagine, if you can, being set loose in a candy store to munch all the goodies you can possibly eat! Race around the store with your jaws chewing away, but beware of the rowdy kids loose in the store. They play a little rough and can be a real pain in the tooth! After you've eaten your fill, we have a special feature that may help reduce cavities. To find and take advantage of our free services, try a JAWBREAKER. Available from your local computer store for $29.95 or order directly from SIERRA ON-LINE.

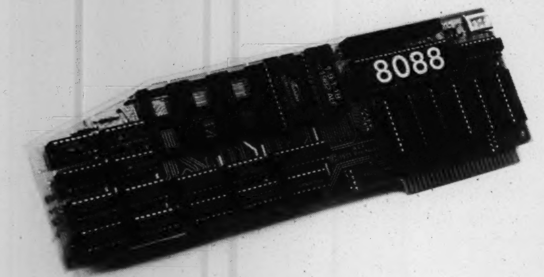
Available on APPLE and ATARI
SIERRAVISION
Sierra ON-LINE INC
36575 MUDGE RANCH ROAD COARSEGOLD, CA 93614
TLX 910 362 5025 209 683 6858


14. How many parachutes can fall before you are the victim of SABOTAGE

In this fast-action arcade game, you are seated behind the working end of a powerful gun base. You must use this anti-aircraft weapon to single handedly fight off the rain of helicopters and their cargo of parachuting saboteurs. Watch out for jets equipped with lethal homing bombs, if you let any of them go, it's all over for you! How many parachutes can hit the ground before you experience SABOTAGE? Available from your local computer store for $24.95 or order directly from SIERRA ON-LINE.

Available on APPLE
SIERRAVISION
Sierra ON-LINE INC
36575 MUDGE RANCH ROAD COARSEGOLD, CA 93614
TLX 910 362 5025 209 683 6858

The speed and power of an IBM PC on a $345 Apple® card.



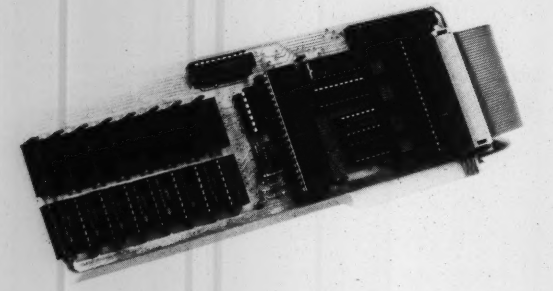
FAST 5 MHZ OPERATION, TRUE MULTIPROCESSING

ALF's AD8088 Processor Card adds a fast 16-bit 8088, the processor used in the IBM PC, to your Apple II. It runs programs from its on-board memory at a full 5 MHz—12% faster than the IBM PC—while the Apple also runs at full speed. And two or more AD8088's can be used in one Apple, to tackle problems that are beyond many mainframe systems.

CP/M-86 AND 192K MEMORY

CP/M-86®, the 8088 version of the industry standard CP/M operating system, is available for the AD8088 for only $200. AD8088 CP/M-86 uses the popular Microsoft Softcard® disk format so you can buy the latest programs direct from major software distributors like Lifeboat Associates.

CP/M-86 uses only 18K, leaving 46K for programs on a 64K Apple—easily enough memory to assemble 12K of object code. For large programs, our $370 AD128K Memory Card provides 110K program space, or 174K program space (192K system memory) for an extra $75.



THE 8087 NUMERIC DATA PROCESSOR

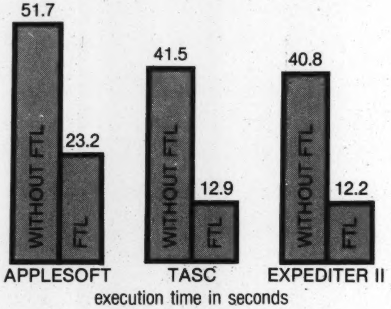
The AD128K Memory Card features a socket for the Intel 8087 Numeric Data Processor. The 8087's 80-bit internal format gives 18 digits of accuracy (Applesoft has only 9). Its speed is equally impressive: it multiplies two 80-bit floating-point numbers faster than the Apple runs 10 machine codes!

FASTER APPLESOFT FOR SCIENTIFIC & ANALYTICAL PROGRAMS

Any program can be rewritten for fast operation with the 8088, but ALF's "FTL" program speeds up math in your existing Applesoft programs—without modification. FTL is activated simply by typing RUN FTL. Programs produced by TASC® or Expediter II® also run faster. The graphs below show the dramatic improvement with FTL.

```
10 PRINT "2 3 ";
20 FOR B = 5 TO
   1000 STEP 2
30 FOR C = 3 TO
   SQR (B) STEP 2
40 IF B/C = INT
   (B/C) THEN 70
50 NEXT
60 PRINT B;" ";
70 NEXT B
```

Program to compute prime numbers from 2 to 1000.



RELIABLE LOW POWER OPERATION

The clean design of the "AD" series separates the two main components—processor and expansion memory, when needed—on two cards. Low-power components are used for cooler operation: each card draws less than an Apple ROM card—far less than a typical 80-column card.

SEE YOUR APPLE DEALER TODAY

An Apple II computer with 64K (48K plus Language Card equivalent) and 13- or 16-sector disk drive is required. The AD8088 and AD128K can be used in any slot.

Trademarks: "Apple": Apple Computer, "TASC", "Softcard": Microsoft, "Expediter II": Einstein/Goodrow, "CP/M-86": Digital Research

ALF

A L F PRODUCTS INC. 1448 ESTES DENVER, CO 80215
(303) 234-0871

CIRCLE 106 ON READER SERVICE CARD

shooting at them, but no matter how many you kill, you can never escape. Coming into contact with either the electrified walls or the robots is deadly. If you wait in a room too long, a smiling Evil Orville chases you out or kills you.

Berserk plays just like the arcade version, only a little bit slower—even though it is written in machine language. One or two players may compete, alternating turns. You use the joystick to move your man through the maze. If you press the fire button, you stop and shoot in the direction that you were moving.

There is no on-screen scoring, nor any indication as to the number of men remaining. When you lose a man, the computer switches to a lo-res screen that shows you this information.

The colorful hi-res graphics of *Berserk* surpass even those of the original arcade game. The movement of the player is very smooth; it actually looks like a real human running. The animation of the robots is equally impressive.

Berserk has nice sound effects that enhance game play. One thing I have found that detracts from the game is the fact that many rooms repeat themselves. In the coin-op version, each room is created randomly whereas in Berserk the rooms seem to be in memory. This leads to rather repetitious playing.

Aside from this small fault, I found *Berserk* a very enjoyable game.

Astro Blast

Another game from Mark Data Products that originated in the arcades is *Astro Blast*. The coin-op game it is modeled after, Astro Fighter, never really enjoyed much success in the arcades. This is strange because it has been imitated on all of the popular home computers.

In *Astro Blast* you control a laser base situated on the bottom of the screen. On each of the first three boards, there is a group of one type of alien. When you destroy an entire group, you advance to the next board. After clearing all three boards, you must dock to replenish your fuel supply; if you run out of fuel, the game is over.

Astro Blast requires the right joystick only, even if two players are competing. Your ship is very responsive to the joystick controls, but not overly so. The movement of both the aliens and your ship is as professional as in the arcade version.

The explosions in *Astro Blast* are perhaps the nicest I have seen in any game—on any computer. The graphics are hi-res and extremely colorful. There are sound effects linked to every action which add to the playability of the game.

I think that *Astro Blast* is one of the best-written arcade games currently available for the Color Computer. It is a very faithful adaptation of Astro-Fighter and well worth the price.

creative computing
SOFTWARE PROFILE

Name: AstroBlast

Type: Arcade

System: TRS-80 Color Computer 16K

Format: Cassette/disk

Language: Machine

Summary: One of the best space shoot 'em ups

Price: $24.95 cassette, $29.95 disk

Manufacturer:
Mark Data Products
23802 Barquilla
Mission Viejo, CA 92691

15. What shocking and terrible sound could you possibly hear in a game called

LAF PAK

This unique software package contains four amusing and challenging arcade games for the price of one! CREEPY CORRIDORS and APPLE ZAP will get your adrenalin flowing, while SPACE RACE and MINE FIELD will drive you mad — with enjoyment! What frightening sound of death will make you laugh? Play LAFF PAK for the humorous answer. Available at your local computer store for $29.95 or order directly from SIERRA ON-LINE.

Available on APPLE
SIERRAVISION
Sierra ON-LINE INC
36575 MUDGE RANCH ROAD COARSEGOLD, CA 93614
TLX 910 362 5025 209 683 6858

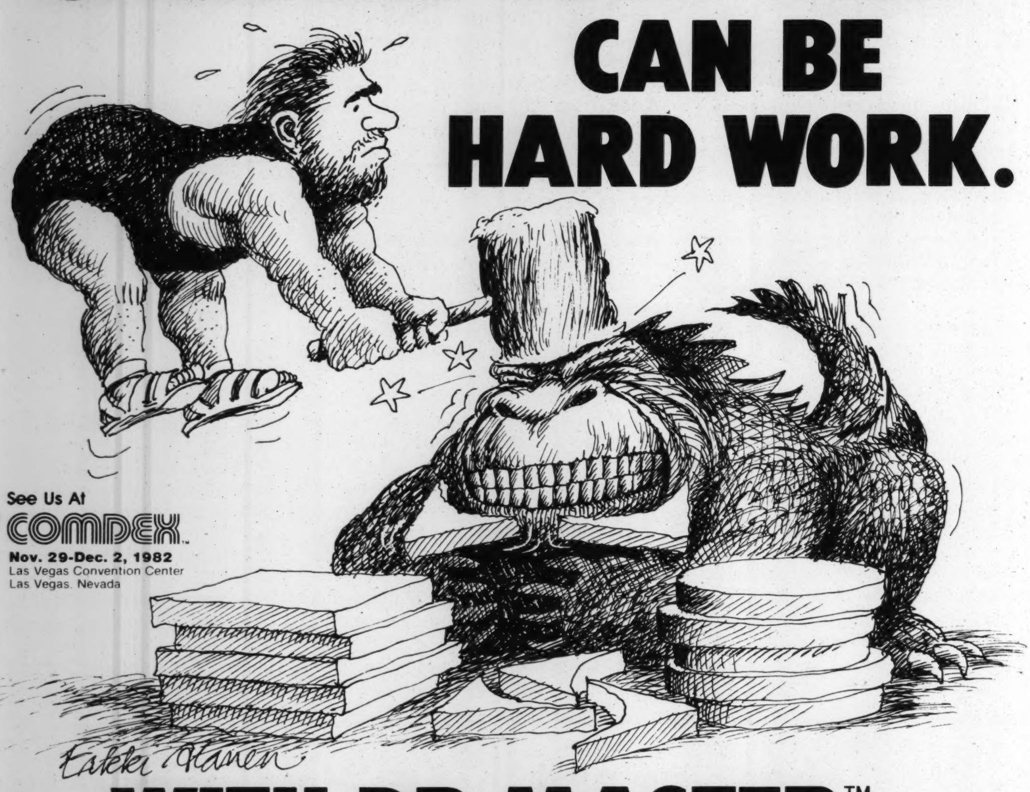
16. How many men are in the spaceships of

Marauder

Attempting to destroy the power center on a planet with a progammed defense system and a race of robotic sentries is one of the most dangerous jobs in the galaxy. Many warriors from all sectors of space have tried, and disappeared forever. That's why it's necessary for several men to try. How many fighters can exit a spaceship and attempt to become the victorious MARAUDER? Available at your local computer store for $29.95 or order directly from SIERRA ON-LINE.

Available on APPLE
SIERRAVISION
Sierra ON-LINE INC
36575 MUDGE RANCH ROAD COARSEGOLD, CA 93614
TLX 910 362 5025 209 683 6858

UPDATING YOUR FILES CAN BE HARD WORK.



See Us At
COMDEX
Nov. 29-Dec. 2, 1982
Las Vegas Convention Center
Las Vegas, Nevada

WITH DB MASTER™ IT'S EASY.

We all know it's got to be done. A new address for a company you deal with means changing the records right away. A client gets married and changes her name. Another change that has to be made in the records. If you're faced with several filing cabinets filled with folders, making simple changes becomes a complicated, time consuming job. And if your mailing list is generated from those records, or if you rely on them for billing information, you'd *better* make those changes quick.

Relax, DB MASTER makes updating records quick and easy. All you've got to do is call up the name of the company or client on the view screen. It takes about three seconds. When the record appears, make the appropriate changes right then. It's over and done with. Immediately. No retyping of an entire record. No anxiety. And as soon as you've made the change, say, from "Colleen Patterson" to "Colleen Smith," DB MASTER refiles it under the new name in the proper sequence. It's all over in less time than it takes you to walk over to the filing cabinet.

And it's easy to correct, change or edit any *part* of a record. Imagine the time savings when you're constantly updating inventory or job records.

We designed DB MASTER to make your life easier. Sure, there are other data base systems for your Apple II. But if you're not using DB MASTER you're simply not getting all you could from your data base manager.

Want more capability? DB MASTER provides it with the expanded-capacity Special Edition for Hard Disk to complement the popular floppy diskette version. *And* there are three powerful accessory programs. UTILITY PAK #1, for example, allows you to access other standard Apple files (including VisiCalc), and even change the way you've structured your files. UTILITY PAK #2 allows you to edit or change up to five "fields" in a single pass through your files. And STAT PAK performs statistical analyses on data in your DB MASTER files. Of course, there's considerably more capability in each of our accessory paks than we have room to talk about here. Ask your dealer for the full details.

Stoneware backs up DB MASTER with a support staff second to none. Just give us a call. We can help solve your problems. After all, that's what Stoneware and DB MASTER are all about.

STONEWARE INCORPORATED®
50 Belvedere Street, San Rafael, CA 94901 (415) 454-6500

© 1982 Stoneware Incorporated. TELEX II: 910-384-2016 STONEWARE SRFL

DB MASTER is a registered trademark of DB MASTER Associates. Apple II Plus is a registered trademark of Apple Computer. VisiCalc is a registered trademark of VisiCorp.

CIRCLE 338 ON READER SERVICE CARD

War Kings

The preceding six reviews have dealt with programs that are conversions of coin-op arcade games. This review and the next, however, concern adaptations of games that run on the Atari VCS. *War Kings* is a Color Computer version of Atari's Warlords. Warlords itself is an advanced version of Breakout.

creative computing
SOFTWARE PROFILE
Name: War Kings
Type: Arcade
System: TRS-80 Color Computer 16K
Format: Cassette
Language: Machine
Summary: Warped version of Breakout
Price: $19.95
Manufacturer:
Tom Mix Software
3424 College N.E.
Grand Rapids, MI 49505

In *War Kings*, each player controls a shield that deflects a bouncing bullet. The object is to protect your castle while trying to penetrate your enemy's. Each time the bullet bounces off the castle, it chips away a piece of the wall. Once a hole has been carved all the way through the wall, the bullet can pass through and hit the king. When that happens, the game is over.

Each player uses one joystick to maneuver his shield around the outside of the castle. The shield does not slide wildly, but rather, in a normal manner. Unfortunately, the bullet doesn't seem to respond to attempts to put english on it. You cannot spin the shield quickly just as the bullet hits it, and cause it to change its path radically.

War Kings is written in machine language and uses hi-res graphics. The playfield has lots of color. The only thing that moves in addition to your shields, is the bouncing bullet. The bullet follows logical paths, depending on the angle of deflection. The sound effects in *War Kings* provide an enjoyable addition to the rather limited game play.

War Kings is similar to a two player version of Warlords on the Atari VCS. If you enjoy Warlords, or Breakout for that matter, you will probably have lots of fun playing *War Kings*. With three selectable levels of difficulty, *War Kings* can provide a challenge for just about any contender.

Catch 'Em

Catch 'Em is the first Color Computer version of Activision's immensely popular *Kaboom*. After playing *Catch 'Em*, I'm sure you'll agree that no other adaptation of this Atari VCS game need be written.

In *Catch 'Em*, the object is to catch all of the falling articles (aliens) with your paddles at the bottom of the screen. You

creative computing
SOFTWARE PROFILE
Name: Catch 'Em
Type: Arcade
System: TRS-80 Color Computer 16K
Format: Cassette/disk
Language: Machine
Summary: Similar to Kaboom
Price: $19.95 cassette, $21.95 disk
Manufacturer:
Aardvark Software
2352 S. Commerce
Walled Lake, MI 48088

17. What winged defense system emits a deathbolt of fire in

PEGASUS II

Traversing the reaches of space in the exploration ship PEGASUS II, you are suddenly the victim of an unprovoked attack. It seems you have triggered the defense systems of a very unfriendly planet. Luckily you are equipped with defense lasers and ground missiles. What amazing beast can breathe your death? Explore the answer by playing PEGASUS II. Available from your local computer store for $29.95 or order directly from SIERRA ON-LINE.

Available on APPLE
SIERRAVISION
Sierra ON-LINE INC
36575 MUDGE RANCH ROAD COARSEGOLD, CA 93614
TLX 910 362 5025 209 683 6858

18. Name one piece of hardware that

ScreenWriter II

allows you to do without?

At Sierra On-Line Inc., we know that users want simplicity when they look for word processing software, and to us — simplicity means solving the little problems that can sometimes keep you from your work.

We made a great effort to make our users manual more of a learning tool and less of a rule book. The tutorial is written to teach you the system completely as you read through it, and a summary of all commands is always available in a special HELP file on disk. You may never need to reference the manual again, once you've read it the first time. Installation of the system is so simple that it doesn't require you to open the lid of your Apple. Just load the SCREENWRITER program and you see the software based lowercase and 40 to 70 column selectable screen that On-Line has become famous for. That's right! NO EXTRA HARDWARE NEEDED.

We work to make our word processor the most user friendly, trouble-free product on the market, and SCREENWRITER II is the fruit of our efforts. Available at your local computer store for $129.95 or order directly from SIERRA ON-LINE.

Available on APPLE
SIERRA BUSINESS PRODUCTS
Sierra ON-LINE INC
36575 MUDGE RANCH ROAD COARSEGOLD, CA 93614
TLX 910 362 5025 209 683 6858

RestonBooks Give You a Helping Hand with... VISICALC®

THE VISICALC® BOOK Apple Edition
apple II

Get more from VisiCalc with new books from Reston Publishing Company. These books make VisiCalc understandable to beginners, while exploring expanded applications for the advanced user. For prospective buyers of VisiCalc, the books offer an opportunity to study the potentials and capabilities of VisiCalc before making an investment.

THE VISICALC BOOK, by Donald H. Beil, is available in Atari*, Apple II*, and IBM Personal* editions. The book presents a straightforward, plain-language approach to understanding and using the software. Numerous practice problems and the "design-your-own" model technique enable you to apply VisiCalc in no time.
Paperback: $14.95

Learn to customize VisiCalc to your own needs with THE VISICALC APPLICATIONS BOOK by Jack Grushcow. Opening with VisiCalc basics, the book goes on to put the software to use in practical business situations. Discover the hows and wheres of applying VisiCalc to your day-to-day problems. For use with Atari, TRS 80 I and II*, and IBM Personal computers.
Paperback: $14.95

Available through your local computer store or bookstore. Or call: 800-336-0338

RestonBooks Reston Publishing Company, Inc.
A Prentice-Hall Company, 11480 Sunset Hills Road,
Reston, VA 22090

*VisiCalc® is a registered trademark of Personal Software, Inc., VisiCorp. Other trademarks include: Atari®, Atari, Inc.; Apple®, Apple Computer, Inc,; TRS 80®, Radio Shack, Div. of Tandy Corp,; and IBM®, International Business Machines, Corp.

CIRCLE 297 ON READER SERVICE CARD

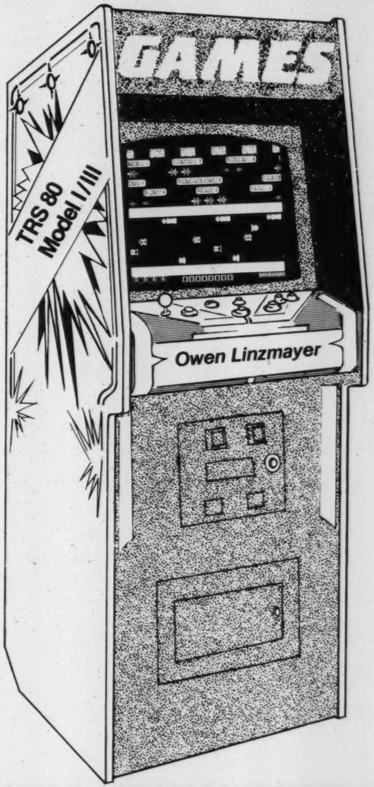
start off with three paddles stacked on top of each other. If you let an object pass below the bottom paddle, you lose the lowest paddle of the stack. When all of your paddles are gone, the game is over. Objects are dropped in clusters from the top of the screen. You must simply touch an object with any paddle to "catch" it.

You use the right joystick to manuever your paddles around the screen. Pushing the fire button launches a group of aliens. There is a total of 16 groups per attack wave. Each group of aliens is different in appearance. This variety is one of the things that make *Catch 'Em* such a fun game.

Catch 'Em, like all good programs, is written in machine language. The graphics are hi-res and plentiful. The aliens are very detailed and colorful, and the sound effects are nice, when they are there.

Although I find the game a bit simple during the first wave or two, it does eventually speed up and become very difficult. Children and less coordinated adults will find that *Catch 'Em* provides a challenge without being insultingly easy.

Catch 'Em is one of my favorite relaxing games. After battling aliens and blowing things out of the cosmos, it is nice to play a game in which everything is not out to kill you.



Bounceoids

In *Asteroids*, leaving the edge of the screen in any direction results in the player reappearing on the opposite side. This feature is called "wrap-around."

What do you think would happen if you took the popular arcade game, Asteroids, and removed the wrap-around func-

creative computing

SOFTWARE PROFILE

Name: Bounceoids
Type: Asteroids variation
System: TRS-80 Model I/III
Format: Cassette/disk
Language: Machine
Summary: Very good arcade game
Price: Tape $15.95, disk $19.95
Manufacturer:
The Cornsoft Group
6008 North Ketstone Ave.
Indianapolis, IN 46220

19. Name one piece of hardware and one large book that

ScreenWriter II PROFESSIONAL

allows you to do without?

One look at our software based lower case and 70 column screen should tell you what hardware SCREENWRITER PROFESSIONAL makes obsolete, but only a closer look will tell you which big book you won't need to reference anymore. This package includes our powerful verification system, complete with a workbook that contains the correct spelling of over 29,000 words. SCREENWRITER PROFESSIONALoffers our **best-selling** word processor complimented with our powerful spelling verification system, a team that is sure to cut the cost of your word processing system. SCREENWRITER PROFESSIONAL is an exceptional value, costing less than all comparable word processors at only $199.95. In fact, the total price of this software-based product is less than the price you could pay for the hardware needed to run competing products. Let SCREENWRITER PROFESSIONAL help make your word processing easier to understand and easier on your budget. Available from your local computer store for $199.95 or order directly from SIERRA ON-LINE.

Available on APPLE

SIERRA BUSINESS PRODUCTS

Sierra ON-LINE INC

36575 MUDGE RANCH ROAD COARSEGOLD, CA 93614
TLX 910 362 5025 209 683 6858

20. What's the extra advantage in

LISA

EDUCATIONAL SYSTEM

Just as LISA is the wise choice for the professional assembly programmer —LISA EDUCATIONAL SYSTEM is the obvious choice for the beginner who wants to learn assembly language.
LISA EDUCATIONAL SYSTEM offers LISA assembler Randy Hydes' 300 page book on assembly for beginners. USING 6502 ASSEMBLY LANGUAGE: and a special library of machine language sub routines that can be used to simulate basic, allowing the Applesoft programmer to begin writing assembly language just hours after opening the manual.
LISA EDUCATIONAL SYSTEM is a valuable tool for the beginner and is available for $119.95 or order directly from SIERRA ON-LINE.

Available on APPLE

SIERRA BUSINESS PRODUCTS

Sierra ON-LINE INC

36575 MUDGE RANCH ROAD COARSEGOLD, CA 93614
TLX 910 362 5025 209 683 6858

THE NORMAL EXPECTATIONS OF SMALL BUSINESS

All too often our normal expectations for small business financial reporting are "logically abnormal". We limit our financial reporting activity to satisfying the needs of the IRS. Kept hidden in most financials is valuable information waiting to be found to assist us in managing our business more profitably. Our normal expectations dictate that the cost and difficulty of organizing and reporting such valuable information will prevent its access.

Likewise, most general ledger systems for the Apple II invariably restrict themselves to assisting us in satisfying the IRS . . . and not much more.

ACU=LEDGER, a newly introduced Financial Management System, represents a **dramatic departure from the "norm".**

ACU=LEDGER simultaneously addresses:

= **General Ledger Requirements** (IRS, etc.)
= **Product Profitability Analysis (Job Cost) (with automatic proration of 'overhead burden')**
= **Financial Budgeting, Forecasting, and Modeling**
= **Automatic Depreciation Scheduling/Posting** (including A.C.R.S.)
= **Instantaneous, upon demand** (on line) **inquiry**
= **Two Accounting Months "open" simultaneously**
= **Full Year's detail entries** retained on the current file

Moreover, **ACU=LEDGER** allows you to describe **your vision of your environment** (emphasizing Marketing, Operations, both, etc.). You can even describe your environment emphasizing one aspect, periodically re-organize to emphasize another, produce the management reports, and switch back to the original 'profile' — or stay with the new!

All of this is done within an integrated, logical universe (no costly redundant input for "Budget vs. Actual" Reporting, etc.). In fact, your bookkeepers' skills will improve because they use **ACU=LEDGER** (many bookkeepers' present difficulties are directly traceable to a problem in finding the "logical thread" that holds the current system together).

ACU=LEDGER's logical structure is easily matched by its technical sophistication, viz.:

= **Produces many times more reports** than competitive systems (up to 289 unique P&L's, daily if you choose)
= **Stores many times more entries** than any competitive system
= **Has multiple techniques** for most functions (may use any or all of 4 methods to post entries)
= **Extremely efficient —** One test "closed" one day's 3,440 "entry-sides" in 2½ minutes!

ACU=LEDGER is so versatile that it can be operated in a very restrictive manner (minimal skill level); or it can be operated utilizing all of its advanced features (or anywhere in between). Migration from one level to another can be effected as you become familiar with **ACU=LEDGER;** and comfort can be taken in the recognition that as your needs change, **ACU=LEDGER** can change with you.

ACU=LEDGER™

for the
Apple II/Apple II Plus
DOS 3.3 (floppy disk)
48K RAM/Printer
Suggested Price $495.00

For more information, see your Apple Dealer or write:

THE
NATIONAL
SOFTWARE CO.
Chamber of Commerce Building
Suite 105
Baltimore, Md. 21202
(301) 539-0124

Distributed Exclusively by

EASTERN SOFTWARE DISTRIBUTORS INC.

Dealer Inquiries Welcome

ACU=LEDGER™ ACU=LEDGER™ ACU=LEDGER™

CIRCLE 247 ON READER SERVICE CARD

Apple II is a trademark of Apple Computer Inc.

tion? *Bounceoids*, the new machine language program written by Robert Pappas, is very similar to that, but much, much more.

The concept of a game of Asteroids without the wrap-around is novel enough, but *Bounceoids* has a slew of added features to tempt the arcade addict in us all. *Bounceoids* offers the traditional features such as bonus ships, high scores, multiple skill levels, a two-player mode, and fast graphics. It also has *many* different challenge stages, sound effects, two sets of keyboard controls, and a variety of strange bounceoid creatures out for blood—your blood.

Bounceoids comes on a self-booting disk that works on both the TRS-80 Model I and III. The internal documentation is well written and explains the controls, point system and how the game is played. You are then prompted to enter the number of players (1 or 2) and the skill level (0-9). Regardless of the level you enter, it will increase at every 10,000 points, until eventually it reaches nine.

If you are playing a two-player game, each player may choose a different starting skill level. This is similar to the start-up sequence found on the coin-op game, Tempest by Atari. It is nice to see programmers making their games function more and more like true arcade games.

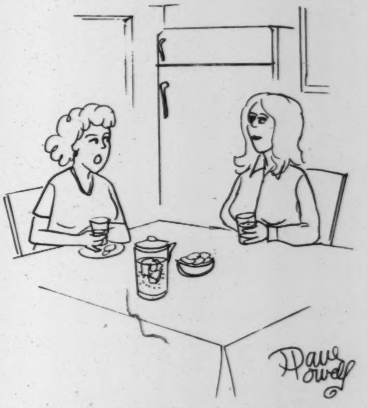
The graphics on *Bounceoids* are fast and smooth—even when the screen is filled with objects in every possible direction.

Controlling your ships is easy. You have the choice of using one of two different sets of keyboard controls or a joystick. One of the sets of keyboard controls is identical to those found in Big Five's *Super Nova* program. This makes it easy for those of us who have become accustomed to those controls.

By using an amplifier connected through the cassette port, you will be treated to sound effects. Using sound effects is the only way to really know how much shield power you have left. Each time your ship is struck while you are using the shields, you lose power. By listening to the sound when you engage the shields, you can tell how many more collisions your ship can survive. At every 10,000 points you are awarded a new ship.

Since *Bounceoids* does not increase significantly in difficulty once you reach skill level nine, it is theoretically possible to play forever, as long as you keep winning new ships.

Bounceoid boulders do not break into smaller pieces when shot; but it takes four hits to eliminate one. There are also Tiny Bounceoids Clusters in which many, many rocks all occupy the same space and follow the same path. These can become quite confusing, not to mention difficult to destroy.



"We can only afford to do one thing at a time... Last Christmas we bought a bunch of electronic games, and the next Christmas we're going to buy the batteries for them."

21. What leading software publisher has changed it's name, and why?

?

Why change your name when you're a leader in the industry? Why change the symbol of a proven winner? The reason is time. As times change, so must leaders if they're to remain on top. We set TODAY'S industry standards and we'll set the standards for TOMORROW. We develop software specifically tailored for the user, whether they are at home, the office or in school. When you find the answer, remember it — you've found a WINNER!

22. You may travel through dungeons, over land and sea, through space and what else?

Ultima II

There is no place to hide from the wrath of Minax the Enchantress. Her evil presence is made known wherever you travel . . .
Now, a very special map has come into your possession and with it you are given your first chance to fight Minax on her own ground.
Be careful! The path to her realm is paved with adventure, and will take you to places that you've only dreamt about. A walk through a very unique doorway will take you to her, and propel you into the challenge of a lifetime . . .
Ultima II offers the very best in fantasy role-playing games. Available at your local computer store for $59.95 or order directly from SIERRA ON-LINE.

Available on APPLE and ATARI

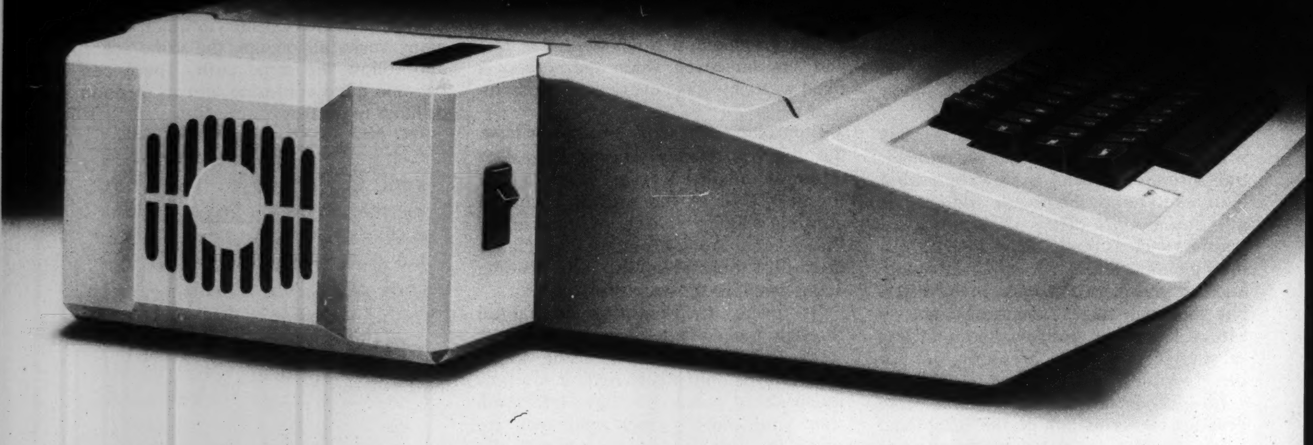
SIERRAVENTURE

Sierra ON-LINE INC

36575 MUDGE RANCH ROAD COARSEGOLD, CA 93614
TLX 910 362 5025 209 683 6858

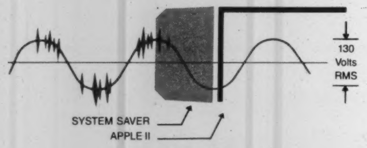
System Saver™

The most important peripheral for your Apple II.



For Line Surge Suppression

The SYSTEM SAVER provides essential protection to hardware and data from dangerous power surges and spikes.

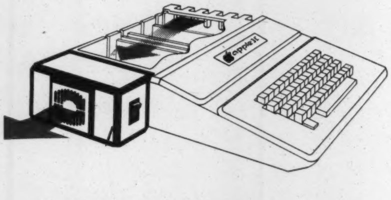


By connecting the Apple II power input through the SYSTEM SAVER, power is controlled in two ways: 1) Dangerous voltage spikes are clipped off at a safe 130 Volts RMS/175 Volts dc level. 2) High frequency noise is smoothed out before reaching the Apple II. A PI type filter attenuates common mode noise signals by a minimum of 30 dB from 600 khz to 20 mhz, with a maximum attenuation of 50 dB.

For Cooling

As soon as you move to 64K RAM or 80 columns on your Apple II you need SYSTEM SAVER.

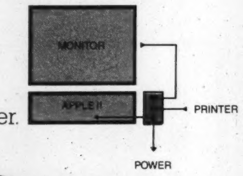
Today's advanced peripheral cards generate more heat. In addition, the cards block any natural air flow through the Apple II creating high temperature conditions that substantially reduce the life of the cards and the computer itself.

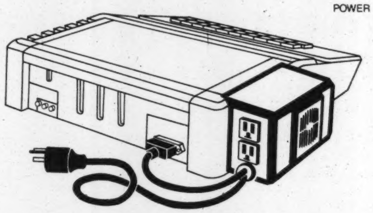


SYSTEM SAVER provides correct cooling. An efficient, quiet fan draws fresh air across the mother board, over the power supply and out the side ventilation slots.

For Operating Efficiency

SYSTEM SAVER contains two switched power outlets. As shown in the diagram, the SYSTEM SAVER efficiently organizes your system so that one convenient, front mounted power switch controls SYSTEM SAVER, Apple II, monitor and printer.

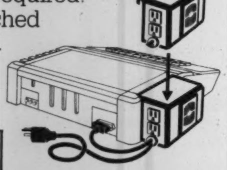




The heavy duty switch has a pilot light to alert when system is on. You'll never use the Apple power switch again!

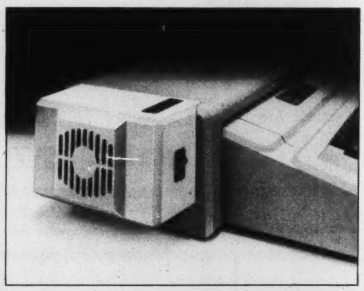
Easy Installation

Just clips on.
No mounting or
hardware required.
Color matched
to Apple II.



UL LISTED

Compatible with Apple Stand



$89.95 at your local dealer or order direct by phone or mail.

For phone or mail orders include $2.50 for handling. New York State residents add 6¼% sales tax.
VISA and MASTERCARD accepted.
Dealer inquiries invited.

Kensington Microware Ltd.
300 East 54 Street, Suite 3L
New York, NY 10022
(212) 486-2802

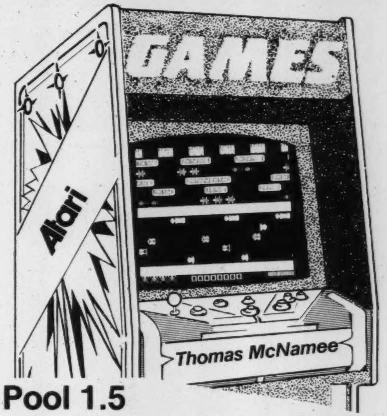
KENSINGTON
MICROWARE

CIRCLE 213 ON READER SERVICE CARD

In addition to all this, there is a special creature that when hit, breaks up into four space stations. Each station goes on one of the four edges of the screen and then follows your every move, occasionally shooting at you. These guys get to be a real pain in the asteroid.

Another thing *Bounceoids* has, that Asteroids doesn't, is Challenge Stages. At every 20,000 points you are treated to one of these showdowns. A string of aliens come on-screen and proceed to swirl around in strange flight paterns. These creatures can't kill you, but they sure provide good target practice for you. There are many different challenge stages and unless you are *very* good, you will not see them all. This variety gives you an incentive to keep on trying just to see what will happen next—a feature that many games lack.

I recommend *Bounceoids*, it's fun, it's different, it's good. What more can I say? *Bounceoids* is a well written arcade game. It is a good example of how a clever programmer can take a rather bland game concept like Asteroids, and turn it into a great new game in its own right. If you are sick of all the different maze type games, *Bounceoids* offers a refreshing change. Give it a try, you'll be coming back for more.



Pool 1.5

My initial reaction to the idea of pool on a computer was that it would be awfully hard to do well. Pool, I thought, would be too much of a physical game to run on a micro. IDSI has proven me wrong with the release of *Pool 1.5* for the Atari.

The first nice feature that *Pool 1.5* provides was revealed to me when I left my Basic cartridge in the computer and tried to load the program. A message appeared on the screen saying REMOVE CARTRIDGE. That was a refreshing change from BOOT ERROR. After removing Basic, the program loaded quickly.

creative computing
SOFTWARE PROFILE

Name: Pool 1.5
Type: Billiard simulation
System: Atari 48K
Format: Disk
Language: Machine
Summary: Excellent high resolution, real time simulation
Price: $34.95
Manufacturer:
IDSI
P.O. Box 1658
Las Cruces, NM 88004

The first screen shows the pool table and a prompt for the number of players (1-4). There is also a Demo mode which demonstrates the action of the balls during play. The computer does not play pool with people, but all of the four games can be played alone.

The players then enter their names, and decide which game is to be played. The game keeps track of whose turn it is by name and, in 8-Ball, will tell you who has solids and who has stripes. You can choose from Straight Pool, 8-Ball, Rotation or 9-Ball. The rules of each game are

23. What's the reward for seeing a female frog home in

FROGGER™

The perils are many for a female frog traveling alone — but a male frog could find his springy legs full of obstacles as he tries to assist her on her journey. Should you be a gentleman and help the lady frog home? Or is discretion the better part of frogger? And most of all — what's your reward if you assist her to her home (in points!).
Find out the answer to these and other questions as you play Frogger, by SEGA. Available at your local computer store for $34.95 or order directly from SIERRA ON-LINE.
™ designates a registered Trademark of Sega Enterprises, Inc.

Available on APPLE and ATARI
SIERRAVISION
Sierra ON-LINE INC
36575 MUDGE RANCH ROAD COARSEGOLD, CA 93614
TLX 910 362 5025 209 683 6858

24. What kind of refreshments does mother give out in

THRESHOLD

The aliens keep attacking, wave after wave, but even the best arcade gamer needs a break once in awhile. A visit to mother will give you a breather, but you'll also get something else. What it is — we won't tell!
How many waves of aliens are there? Although the game was introduced on the APPLE almost a year ago, many of the most avid players of this game still haven't seen the last of the vast array of aliens that THRESHOLD has to offer. Give them time though, they won't quit playing until they can!
Threshold is an arcade game offering over twenty waves (how many more we won't tell) of aliens attackers brought to life with quick animation and colorful Hi-Res Graphics. Available for $39.95 at your local computer store or order directly from SIERRA ON-LINE.

Available on APPLE and ATARI
SIERRAVISION
Sierra ON-LINE INC
36575 MUDGE RANCH ROAD COARSEGOLD, CA 93614
TLX 910 362 5025 209 683 6858

GET FREE SOFTWARE FOR YOUR COMPUTER!

HOW? JUST ORDER ANY OF THE ITEMS BELOW, AND SELECT YOUR FREE SOFTWARE FROM THE BONUS SOFTWARE SECTION, USING THE FOLLOWING RULE: FOR THE FIRST $100.00 WORTH OF MERCHANDISE ORDERED TAKE 1 ITEM; FOR THE NEXT $200.00 WORTH OF MERCHANDISE ORDERED TAKE ANOTHER ITEM; FOR THE NEXT $300.00 TAKE A THIRD ITEM, ETC. ALL AT NO COST.

HARDWARE by APPLE COMPUTER & FRANKLIN:

APPLE II + 48K	1199	PASCAL DISK + BKS	200
FLOPPY DR. + CNTRLR	545	FLOPPY DRIVE	465
APPLE III 128K	2999	PILOT	125

We carry the rest of the APPLE and FRANKLIN line at low, low prices! CALL!

OTHER HARDWARE for APPLE/FRANKLIN:

D.C. HAYES:

Micromodem II	285	Smartmodem	225
		·Smartmodem 1200	CALL

MICROSOFT:

Z80 Softcard	269	16K Ramcard	119

MOUNTAIN COMPUTER:

Expansion Chassis	559	Music System	339
A/D + D/A Card	289	CPS Multi-function	169
X/10 Control Card	169	Super Talker	169

CALL FOR MORE PRICES! WE CARRY FULL LINE!

CALIFORNIA COMPUTER SYSTEMS:

Centronics Par. Int.	115	Async. Serial Int.	135

CALL FOR MORE PRICES! WE CARRY FULL LINE!

VIDEX:

80 Col. Bd. & Softswitch	245	Enhancer II	125
Enhancer I	105	Softswitch	29

MORE OTHER HARDWARE FOR APPLE/FRANKLIN:

SSM AIO-II	195	Keybd. Co. Num. Keypad	129
SSM Serial ASIO	115	Sunshine Joystick	39
SSM Par. APIO	99	Game Paddles	29
Novation Apple Cat	319	Shadow/Vet	675
Versawriter Tablet	249	SUP'R'MOD	29
Prac. Periph. Microbuff (32K)	249	Prac. Periph. Microbuff (16K)	225

OTHER SOFTWARE for APPLE/FRANKLIN:

PERSONAL SOFTWARE/VISICORP:

Visicalc 3.3	195	Visifiles	199

CALL FOR MORE PRICES! WE CARRY FULL LINE!

MICROSOFT:

APPLE Fortran (Z80)	129	APPLE Cobol (Z80)	499
TASC Basic Compiler	139	MBASIC Compiler (Z80)	299
TIME Manager	125	MuMath	199
ALDS	99	M/SORT	149

MICRO-PRO:

Wordstar	225	Mail-Merge	99
Spellstar	149	Data-Star	199
Super-Sort	149	Calc-Star	149

PEACHTREE: BIZ Packages, all	CALL
SYSTEMS PLUS: BIZ Packages, all	CALL

MORE OTHER SOFTWARE for APPLE/FRANKLIN:

DB Master	179	DB Master for CORVUS	399
ASCII Express	55	PFS	85
Sorcim Super Calc	189	Dakin 5 BIZ Bookkeeper	299
Howard Tax Prep	115	Broderbund Payroll	325
Howard Real Estate Anal	129	BPI Accounting Pkgs/ea	325

WORD-PROCESSORS & SPELLERS for APPLE:

Wordstar CP/M	225	EZWriter Prof. Sys.	149
Magic Wand CP/M	299	MUSE Super Text 80	150
Executive Secretary	199	Wordpower	50
Letter Perfect	125	Hebrew II	55
Magic Window	85	Screenwriter II	110
Spellguard	219	Spellstar CP/M	149

Word Handler (Gives 80-Col. & Lower-Case with no board!)	199

PRINTERS

EPSON:

MX80	499	MX80 F/T	549
MX100 w/Graftrax	729	MX80 Ribbon	15
APPLE Intfce/Cbl	85	GRAFTRAX	60
GRAPPLER Intfc	149	MX100 Ribbon	24

C.ITOH:

F-10 Daisy Wheel (Par)	1495	F-10 Daisy Wheel (Ser)	1495
Pro-Writer (Par/Ser)	599	Pro-Writer (Par)	499
F-10 Tractor Option	225	Printer Interfaces	CALL

NEC:

PC-8023A	495	NEC 7710 Daisy	2345

QUME:		**DIABLO:**	
SPRINT 9/45	1995	630 R/O	2099

OKIDATA:

Microline 82A	475	Microline 80	375
Microline Tractor	59	Okigraph I	79
Microline 83A	799	Microline 84 (Par)	1099

IDS:

560 with graphics	1095	Prism-Print Software	49
Prism 80 (Basic)	899	Prism 132 (Basic)	1050
Auto Sheet Feed	125	Prism Color	325
Sprint Mode (200 cps)	125	Dot Plot Graphics	85
SMITH CORONA:	689	**BROTHER HR-1**	CALL

ADD-ON MEMORY CARDS & DISK DRIVES FOR APPLE

MEMORY:

Microsoft 16K Ramcard	139	Saturn 32K Card	199
Legend 128K Ramcard	649	Saturn 64K Card	369
Legend 64K Ramcard	299	Saturn 128K Card	525
SVA 256K APL-Cache	1045	Prometheus 128K	439
AXLON 320K Ram Disk	1149	16K of 4116, 200 NS Mem.	25

APPLE-COMPATIBLE FLOPPIES by MICRO-SCI:

With Controller		No Controller	
A35 Exact Replacement	460	A35 Exact Replacement	415
A40 40-Track	489	A40 40-Track	399
A70 70-Track	599	A70 70-Track	499

8" FLOPPY DISK SYSTEMS:

SVA AMS8000 Dual SSDD	1945	SVA AMS8000 Dual DSDD	2595
SVA ZVX4 Quad Cntrllr	495	SVA Disk 2 + 2 Cntrllr	359

CORVUS HARD DISKS:

6 MB Hard Disk	2249	Apple Interface	175
11 MB Hard Disk	3945	Other Computer Intfce	CALL
20 MB Hard Disk	4769	Mirror Back-Up	675

MONITORS, PLOTTERS & PERIPHERALS

MONITORS:

Zenith 12" Green	125	Zenith 13" Color	359
Amdek 12" Green (300G)	175	Amdek 13" Color	359
BMC 12" Green	119	BMC 12" Color	349

PLOTTERS:

Watanabe 4-Pen	1150	Watanabe 6-Pen	1400
Strobe Plotter 1-Pen	699	Strobel Apple Intfce	99
Houston Inst. DMP-3	929	Houston Inst. DMP-4	1185

FLOPPY DISKS

Elephant 5.25" Soft SSSD/bx	25	Elephant 8" Soft SSSD/6xr	29
3M 5" Soft SSD/bx	27	3M 8" Soft SSSD/bx	32
Maxwell 5" Soft SSSD/bx	31	Maxwell 8" Soft SSSD/bx	35
DYSAN 5" Soft SSSD/bx	37	DYSAN 8" Soft SSSD/bx	49

COMPUTER SYSTEMS

ATARI

ATARI 800 (16K)	629	PAC-MAN	33
810 Disk Drive	449	ATARI 410	79
16K Ram Memory	89	825 Printer	575
Microsoft Basic	69	850 Interface	169
INTEC 32K Ram Memory	129	ATARI 800 (48K)	739
OSBORNE 1	1695	***KAYCOMP II**	1699

XEROX
Full Line at Rock Bottom Prices. CALL!

NEC
Full Line at Low, Low Prices! CALL!

HEWLETT-PACKARD
Entire Line at Hugh Discounts! CALL!

HARDWARE FOR IBM PC

AMDEK Color II Monitor	769
BABY BLUE Run CP/M!	549
CORVUS Hard Disks	See CORVUS Section this page
CORVUS/IBM PC Intfce	239
MICROSOFT 64K RAM cd	395
MICROSOFT 128K RAM cd	555
MICROSOFT 256K RAM cd	875
QUADRAM 256K, 4-Function Card	699
PERCOM Drives	CALL
TECMAR We carry complete line!	CALL
TANDON 5.25" Floppy Drive SD	249
TANDON 5.25" Floppy Drive DD	329
SEATTLE RAM & RS232 Port	CALL

SOFTWARE FOR IBM

ASHTON-TATE dBASE II	CALL
CONTINENTAL Home Accountant	125
INSOFT Accountant per Module	99
INFO UNLTD Easy Writer II	259
MICROPRO Wordstar	285
SORCIM Supercalc	219
VISICORP Visical C/256K	195
VISICORP Visifile	249
VISICORP Visitrend/Plot	249
VISICORP Desktop Plan	249

GENERAL CP/M SOFTWARE

MICROSOFT:

Basic 80	275	Edit 80	139
Basic Compiler	299	Mu Math/Mu Simp	199
Fortran 80	339	Mu Lisp/Mu Star	159
Cobol 80	499	M-Sort	128
Macro 80	139	Multi-Plan	CALL

MICROPRO:

Wordstar	275	Calcstar	199
Mailmerge	89	Supersort	165
Spellstar	165	Custom Notes	275
Datastar	239		

ASHTON-TATE:

dBASE II	475	dBASE II Guide	29

SORCIM:

Super Calc	189		

FOX-GELLER:

Quickscreen	129	dUTIL	69
Quickcode (Writes programs for dBASE II)			199

BONUS SOFTWARE SECTION!

SUPER MESSAGE: Creates colorful, dynamic on-screen messages in full page "chunks". Each message allows statements of mixed typestyles, typesizes and colors, in mixed upper and lower case. Styles range from regular APPLE characters, up to double-size, double-width characters with heavy, bold font. Six colors may be used for each different typestyle. Vertical and horizontal centering are available, and word-wrap is automatic. Users can chain pages together to make multi-page messages. Pages can be advanced manually or automatically. Multi-page messages can be stored to disc or recalled instantly $50

APPLE DATA GRAPH 2.1: Plots up to 3 super imposed curves on the Hi-res Screen both X & Y axes dimensioned. Each curve consists of up to 120 pieces of data. Graphs can be stored to disc and recalled immediately for updating. Great for Stock-market Charting, Business Management, and Classroom instruction! $35

APPLE RECORD MANAGER: Allows records within any file to contain up to 20 fields, with user-defined headings. Information can be string or numeric. Users can browse thru files using page-forward, page-backward or random-search commands. Records can easily be searched, altered or sorted at will. Works with 1 or 2 drives. Records or Files can be printed, if desired $40

APPLE LITERATURE INDEX: Allows rapid retrieval (via keywords) of references from total APPLE literature thru June 1981, on 5.25" disc. Each entry in the Index consists of the article, author-name, periodical-name, date of issue, & page nos. The Index is intended to support large magazine files which would require lengthy manual searching to recover information. Annual updates will be available $60

WORDPOWER: Is a simple, powerful, low cost, line-oriented word processor program. It offers a fast machine language FIND & REPLACE. Text can be listed to screen or printer. Lower-case adaptors are supported. You can merge files, move group of lines, and easily add, change, or delete lines. Good for business or personal use. $50

LABELMAKER: Allows a given label to be generated in any quantity from 1 to 32767. The program generates labels not only for addresses, but also for price-tags, part numbers, and mail-messages such as "RUSH", "FRAGILE", etc. A self-incrementing feature allows theatre-tickets to be produced, with a date, and numbers running from a000 to z999. An editor is provided for editing labels prior to printing. All labels may be saved to disc for instant recall $35

APPLE INVOICER: Allows entry of price, quantity, & description of items. Automatically calculates horizontal & vertical totals, figures in sales tax, & special handling. Then it generates required number of invoice copies. Good for people who need arithmetic done automatically! $50

MAIL SUPREMACY: A guick 'n' easy mail list package. Allows a fifth line for foreign country or customer code. Searches & sorts rapidly. Works with 1 drive. $30

APPLE FUNNYWORD: A party amusement! Creates endless artificial comical words on screen or printer! Examples: IDAHEN! UPOTIJI! VUTOHEG! BEJATAV! OKYWEXU! GOPAGA! Good fun for feeble-minded! $20

Above software for APPLE DOS 3.3 only. Call for BONUSES for other systems.

TO ORDER: Use phone or mail. We accept VISA, MC, COD's, personal checks & money orders. Add 4% for credit card. Customer pays handling on COD orders. Foreign orders must be in U.S. Dollars & include 10% for handling. Conn. residents add 7.5% sales tax.

*Not available thru mail-order.

CONN. INFO. SYSTEMS CO.
(203) 579-0472
218 Huntington Road, Bridgeport, CT 06608

Not responsible for typographical errors. Prices subject to change without notice

CIRCLE 158 ON READER SERVICE CARD

kept simple to allow for individual variations in play.

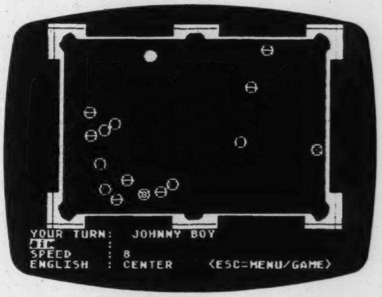
The only difference I found in the rules was in 9-Ball. The program returns the 9 ball to the table when it is sunk out of turn. When I play Uncle John in southern Maryland, the rule is that sinking the 9 ball using a proper combination is the end of the game. I have lost many quarters to Uncle John because of that rule, so I remember it well. The play of the other three games is pretty much the way I was taught.

The game is played with either the keyboard or the paddle controllers. The cue ball appears as a white ball on a red surface with a dotted line extending from it to a "ghost" ball which represents the point of impact for the cue. Rotating the paddle moves the ghost ball and provides coarse aiming at 128 different locations around the cue. Pressing the A key at this point allows fine aiming at a resolution of 32 positions to either side of the selected coarse position.

Aiming is only one of three parameters to be chosen, however. Pressing the space bar will bring you to the speed selection, where a 1 is a light tap and an 8 is an extremely hard shot. Pressing the space bar again switches down to the english selection. Using the paddle, you choose from top, bottom, center, left or right and combinations thereof. Pressing the paddle fire button shoots the ball. This can be done at any time, with the speed and english defaulting to your last selections.

When the shot is off, the realism begins. The balls make a pleasant clicking sound as they hit each other, and a sunk ball makes kind of a gulping noise, as if it had been eaten. The physics of collision have been reproduced very well, and shots must be aimed and hit properly. In the case of a scratch, the cue is returned for positioning. The program questions the user if any balls sunk during the scratch are to be returned, allowing for individual tailoring of the rules.

There are several key-selected features in Pool 1.5. A favorite of mine is the Repeat Shot. Pressing the R key will restore the table to its last condition and allow you to change the angle or speed or english and try again. In several games with one of my cats, I've found this feature great for cheating. He doesn't know the difference.



```
YOUR TURN:  JOHNNY BOY
[illegible]       :
SPEED    : 8
ENGLISH  : CENTER     <ESC=MENU/GAME>
```

The balls appear either as stripes and solids, or with their numbers showing. The C (color) key allows the user to choose between these two options. The ESC key toggles between the game table and the menu/scoreboard. The scores for all players are kept here, and is updated each game so that a tournament of many games is possible. Other user-controlled functions include setting the table friction and the motion or speed at which the balls interact.

The keyboard commands are a little tough to master, and setting up a shot can require quite a few keystrokes. It takes several trips between the paddles and the keyboard before you can shoot. Although the high resolution part of the hi-res graphics is excellent, I find the uniform background and table color of red to be unattractive. Perhaps a later release of *Pool 1.5* will include a set-up feature to permit trick shots. But overall, the reproduction of the game of pool is accurate and fun. It is a relaxing and enjoyable game.

25. What does a
LUNAR LEEPER
like to eat for lunch?

Well, it's not a sandwich, but it could be a manwich. They usually want something more substantial for lunch, though. It's your job to make sure they stay hungry, but this makes them hopping mad! Lunar Leepers can eat you out of house and home, though they prefer you between two slices of bread. Their eyesight is sharper than yours or mine, but their vision isn't 20/20. To see what we mean, play the fast-moving LUNAR LEEPERS. Available at your local computer store for $29.95 or order directly from SIERRA ON-LINE.

Available on APPLE and ATARI
SIERRAVISION
Sierra ON-LINE INC
36575 MUDGE RANCH ROAD COARSEGOLD, CA 93614
TLX 910 362 5025 209 683 6858

26. What two things do the mice in
Mouskattack
like to eat most?

While on a plumbing job in the infamous regions of Rat Alley, you learn the hard way that all the rumors are true! There ARE large carnivorous rats everywhere. It's been known for some time that many plumbers before you have disappeared in the same area. That may be a hint to one of their favorite foods, but what is the other?
Find out a new meaning for the word "catfood" by playing MOUSKATTACK. Available at your local computer store for $39.95 or order directly from SIERRA ON-LINE.

Available on APPLE and ATARI
SIERRAVISION
Sierra ON-LINE INC
36575 MUDGE RANCH ROAD COARSEGOLD, CA 93614
TLX 910 362 5025 209 683 6858

If Your Apple™ Could Choose Your Payroll Software . . .

It would choose MICROPAYROLL™ from ALTERNATIVE SOFTWARE, INC.

ALTERNATIVE SOFTWARE, please!
JOE'S
XYZ
ACME
E. PETERSEN

Even the Apple, the largest selling personal computer in the world, is only as intelligent as its software. And APPLE ORCHARD, the magazine for Apple users, rates **Alternative Software's MICROPAYROLL #1** for tackling the time-consuming complexities of payroll.

So if you have 2 to 145 employees, an Apple II Plus or Apple III, Alternative Software has the best available payroll program. Here's Why:

1. MICROPAYROLL has been USER-TESTED for over three years.
2. The inexperienced payroll clerk will find the instruction manual exceptionally easy to understand; actual examples of problems and their solutions are included.
3. MICROPAYROLL can pay each employee in one or more modes: Fixed-Salary, Commission, Piecework, Hourly, Multiple Overtime Rates, or any combination thereof.
4. Your payroll clerk can update the tax tables himself. Costly factory updates are not required. Handles up to three states simultaneously.
5. Can adapt to nearly any printer.
6. All necessary payroll data is produced and printed: Paychecks, Quarterly Reports, Year-To-Date, W-2 Master Listings, W-2 Slips, Master Payroll List, Seniority List, Time Card Data Entry.
7. Password and Management protection.
8. The Alternative Software MICROPAYROLL is backed by a network of local dealers who can provide technical support and who have direct access to the manufacturer.
9. **Special Introductory Offer from RF Distributors: $299.00** ($50.00 off the $349.00 retail price). Buying an Apple plus Alternative Software's MICROPAYROLL is less expensive than one year's payroll service!

The key to the performance of your computer is the quality of the software that runs it.

For more information on Alternative Software's MICROPAYROLL, please call Jack Loughridge at (609) 424-6055. Or, clip the coupon below.

ALTERNATIVE SOFTWARE, INC.

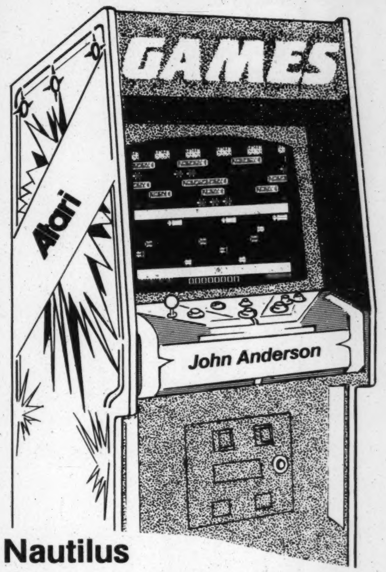
THE
INTELLIGENT
ALTERNATIVE

For more information on RF Distributors special offer, mail this coupon to RF Distributors, Dept. A-11, 314 Society Hill Blvd., Cherry Hill, NJ 08003.

NAME
TITLE
COMPANY
ADDRESS
CITY
STATE ZIP
BUSINESS PHONE ( )

APPLE is a trademark of Apple Computer, Inc.
MICROPAYROLL is a trademark of Alternative Software, Inc.

CIRCLE 110 ON READER SERVICE CARD



Nautilus

Mike Potter has done it again—this time in the guise of Captain Nemo. So much goes on in *Nautilus* it's hard to know just where to begin.

If you are familiar with *Protector* you will be reminded of it when playing *Nautilus*. Many facets of game play are similar, including a scrolling "microworld" several screens wide, and cities of steel and glass. Potter has developed an imaginative, storytelling style, and it is gaining in scope.

There are two independently scrolling screens in *Nautilus*. The top screen maps the progress of Colossus, the destroyer that constantly ferries repair teams across the microworld sea. It is armed with depth charges and heat seeking missiles, and can move at high speed. Among other dangers, the captain of the Colossus must remain wary of helicopter air attack.

The bottom screen maps the position of Nautilus, the malicious, energy-starved submarine. The Nautilus is armed with unlimited torpedoes, which are very handy—for the sea is filled with dangers. Besides the depth charges and smart missiles dispatched from Colossus, the deep is populated by limpet lurkers, dastardly and unrelenting smart mines. They lock on the course of the Nautilus, and maintain pursuit. It takes up to five direct torpedo hits to put one out of commision.

creative computing

SOFTWARE PROFILE

Name: Nautilus

Type: Arcade/strategy wargame

System: Atari 400/800 32K

Format: Cassette/disk

Language: Machine

Summary: Unique and engrossing action game

Price: $29.95

Manufacturer:
Synapse Software
820 Coventry Rd.
Kensington, CA 94707

The goal of play for the commander of the *Nautilus* is to destroy underwater cities. In the cores of these cities reside the proto-pods which must be captured to replenish the voracious batteries of the sub.

Meanwhile, upstairs, the Colossus transports underwater repair crews to the rescue. On its way, it positions itself over the Nautilus, and unleashes a deadly mix of missiles and depth charges. It continues then to the western shore to drop off its crew. The crew will work its way eastward, repairing destroyed cities as it does. If the Nautilus remains in proximity to a city under repair, it will be destroyed. It therefore becomes a priority to keep the Colossus from ever reaching the western shore.

The captain orders Nautilus to the surface, and steers it into shallows where there are no smart mines. Here it lies in

27. What is the secret password to begin

MISSION ASTEROID

Get the password — or become a victim of it. Your password will constantly remind you of your mission — a race against time to save the Earth. Better hurry though, the sky is beginning to fall! Available at your local computer store for $19.95 or order directly from SIERRA ON-LINE.

Available on APPLE and ATARI
SIERRAVISION
Sierra ON-LINE INC
36575 MUDGE RANCH ROAD COARSEGOLD, CA 93614
TLX 910 362 5025 209 683 6858

28. What password is hidden on the restroom wall in the adult text adventure

SOFTPORN ADVENTURE

Read the handwriting on the wall and set out for your ultimate fantasies in the gambling capital of "Lost Vague-ness". You didn't bring much spending money, but maybe lady luck will shine your way when you visit the addicting casinos. Be forewarned though, being too immoral can result in death, purgatory, or ? SOFTPORN is available at your local computer store for $29.95 or order diretly from SIERRA ON-LINE.
*NOTE: This game is R-Rated. It is not suggested for minors or persons easily offended. This question may be omitted from your answer sheet if the subject matter offends you.

Available on APPLE and ATARI
SIERRAVISION
Sierra ON-LINE INC
36575 MUDGE RANCH ROAD COARSEGOLD, CA 93614
TLX 910 362 5025 209 683 6858

OF ALL THE THINGS YOU BUY, HOW MANY ARE GOOD ENOUGH TO BE WARRANTED 5 YEARS?

Few disks stand the test of time. Because few are built to the precision standards or certified to the critical levels of Omni's complete line.

Each Omni disk is rated for 12 million passes without disk-related errors or significant wear. Each is certified error-free at a minimum of twice the error-threshold of your system. And built to exceed all industry specifications including those of ANSI, ECMA, ISO and virtually every drive manufacturer. So you can count on them for the long haul. We guarantee it.

Call toll-free (800 343-7620) for your nearest dealer. In Mass., call 617 799-0197.

Omni Resources, 4 Oak Pond Ave.,
Millbury, Mass. 01527

Dealers. Software houses.

Check our prices, services and specifications. We offer duplicating, formatting, private labeling, small minimums, fast delivery and copy protection schemes on disks for virtually any system.

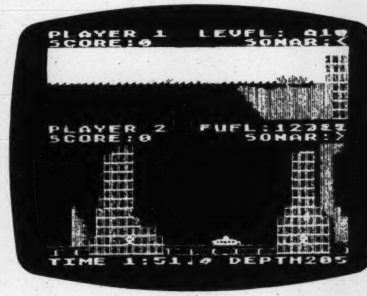
OMNI

THE DISK GOOD ENOUGH TO BE WARRANTED 5 YEARS

CIRCLE 237 ON READER SERVICE CARD

ambush, in hopes of damaging Colossus enough to force it back to the eastern port.

The dual screen approach is unique, and allows the positions of both ships to be depicted simultaneously, even though they may be as many as five screens removed from one another. Sonar aboard each ship indicates the relative position of the other. When their screen locations coincide, the command console flashes red.



The ships can repair themselves as many times as necessary, but repairs cost precious time. The Nautilus must be careful not to so much as graze any solid surface—she goes down if she does. This makes navigation of the many underwater caverns a tricky business.

Nautilus can be played by two players, one at the helm of the Colossus, the other of Nautilus, or as a solitaire game, with the computer controlling the destroyer. Length of the game is selectable from three to nine minutes. There are nine skill levels, as well as the option to energize energy core transformers, gates throughout the sea, making the game extremely hazardous. This mode is not for beginners.There is a handicapping option as well.

Nautilus is a tour de force. The opening music is excellent, and hints at a context for the game—the tune is "Volga Boatmen."

The really appealing thing about the game, as in its predecessor *Protector*, is the creation of a microworld; in this case an undersea world, full of secret grottos and hidden dangers. The fine-scrolling graphics capabilities of the Atari are used to their fullest potential. *Nautilus* is another must from Synapse Software.

I do have a complaint, and though it is a small one, it is persistent. Allow me to appeal not only to Mr. Potter, but to *all* game designers with this plea: *please include a pause feature in your games*! Do it with the space bar, the escape key, CONTROL-1, SELECT; I don't care how, but please do it. It should be noted that the lack of such a feature becomes evident not only when the phone rings, but when it comes time for us to take pictures of a program for inclusion in a review such as this one.

Pause or no pause, *Nautilus* is addictive and a lot of fun. I recommend it very highly.

Shamus

In the August 1982 issue, I wrote about the burgeoning "arcade adventure" format for Atari games. I spoke specifically about *Action Quest*, a brutally tough but very compelling hybrid adventure, calling for hand-eye dexterity as well as adventure skills.

Shamus, also from Synapse Software, takes another stride in the development of the arcade adventure. Make sure you have no pressing appointments before becoming involved in a round of *Shamus*. Once you get going, you won't want to stop for a while.

The humorous feeling surrounding the game provides much of its appeal. Author William Mataga first sets the mood, with a grand rendition of the theme from the

29. Which top Apple Software Publishing company uses

the Artist

to create its

amazing graphics and animation?

(We'll give you a little hint on this one.)
The graphics and animation routines used in Mouskattack, Threshold, Crossfire and Time Zone were created by The ARTIST, and you'll find this package in use by such noted programmers as Warren Schwader, Rob Davis and Ken Williams. QUESTION: Which publishing house employs these programmers, and why do they all use The ARTIST?
Could it be because The Artist offers some of the fastest animation routines ever written, or could it be the colorful routines that make a Hi-Res picture come to life.
With The ARTIST, the Applesoft or machine language programmer can program Hi-Res graphics and animation — quickly and easily — with fantastic results.
The ARTIST is now available for $79.95. Review the ARTIST at your local computer store or contact SIERRA ON-LINE.
Available on APPLE

SIERRA BUSINESS PRODUCTS

Sierra ON-LINE INC

36575 MUDGE RANCH ROAD COARSEGOLD, CA 93614
TLX 910 362 5025 209 683 6858

30. Describe one function that can do what no other Apple spelling verification system can do?

DIC·TION·ARY

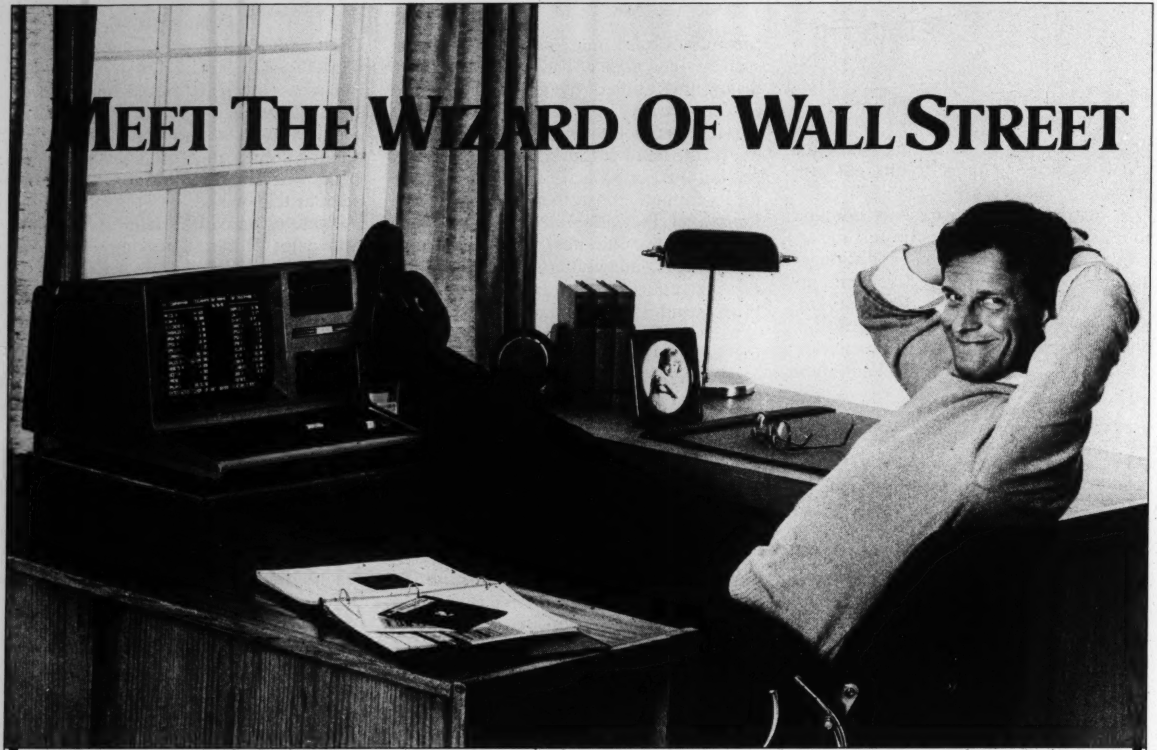
There's more than one answer to this question, but you need only name one of the many powerful functions which make THE DICTIONARY unique in the world of Apple word processing systems. You could describe the function that will have your paper dictionary on the shelf collecting dust. Or you could describe the function that nullifies the need for a second run through your word processor after verification.
Find out what makes the DICTIONARY so much more different. It's available for your review at your local computer store for $99.95 or order directly from SIERRA ON-LINE.
Available on APPLE

SIERRA BUSINESS PRODUCTS

Sierra ON-LINE INC

36575 MUDGE RANCH ROAD COARSEGOLD, CA 93614
TLX 910 362 5025 209 683 6858

MEET THE WIZARD OF WALL STREET



Standard & Poor's STOCKPAK system can turn any investor into a whiz

Whether you're an active investor, or just considering the best ways to invest, STOCKPAK can turn you into a Wall Street Wizard.

Sophisticated software that's easy to use

STOCKPAK is a sophisticated software system that offers you an easy and economical way to obtain and evaluate important investment information to help you make better investment decisions. In fact, in virtually no time at all, you can put STOCKPAK to work for you performing a wide range of investment functions.

Screening power is at your command

Our Screen and Select system lets you apply your own investment criteria to a 900-company database. For example, you can tell STOCKPAK to find only large companies, or only small ones...only those with high earnings growth, or low P/E's, or high dividends... only those in certain industries, or on specific exchanges...only those above or below a certain price... or only those with high sales, or low debt, and so on.

STANDARD & POOR'S STOCKPAK AND PORTFOLIO MANAGEMENT SYSTEM

In fact, you can draw from over 200 specific information items to compose a single screen. And, you can establish your own targets and cut-off points in each of these 200 areas. STOCKPAK will oblige by searching through the entire database to find only those companies that satisfy your criteria.

More feats of wizardry with STOCKPAK

Standard & Poor's time-tested software also lets you evaluate and manage actual or hypothetical portfolios of up to 100 stocks each. And, you can create your own customized reports—displayed the way you want them.

Whether you use STOCKPAK to help improve your investment decisions, or just for the fun of it, it's good to know the source of this wizardry: Standard & Poor's, one of the world's leading financial publishers with a 120-year reputation of service to the investment community.

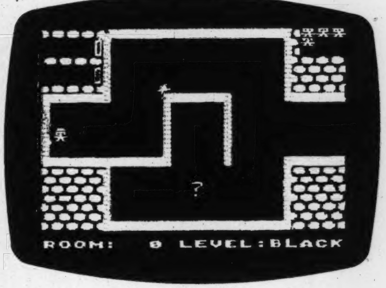
Visit your local Radio Shack Computer Store today

STOCKPAK is designed exclusively for use on the TRS-80 Models III and I computers with 32K business systems and two disk drives. The basic software and sample database plus complete documentation is available from your Radio Shack computer store for only $49.95. The STOCKPAK monthly updating service can be ordered directly from Standard & Poor's for only $200 annually. Visit your local Radio Shack today for additional information and a demonstration.

STANDARD & POOR'S CORPORATION
25 BROADWAY, NEW YORK, N.Y. 10004

© STANDARD & POOR'S 1982

CIRCLE 335 ON READER SERVICE CARD



old Alfred Hitchcock show. The player is then thrust into a complex maze of 32 rooms, containing some very diabolical nemeses. As Shamus, the player must penetrate four levels of 32 rooms each, to finally destroy the Shadow in the heart of his lair.

Don't hold your breath waiting for the completion of this goal. It is bound to take you at least a month. You see, populating each room are the Shadow's henchmen: Whirling Drones, Robo-Droids, and Snap Jumpers. The sole pleasure in their lives is to keep you from getting near their leader. And they do a job of it. You are armed with Ion Shivs, and as your opponents are always prepared to fight to the death, the action is necessarily violent.

For those of you who have always wanted to wear a fedora as a character in an Atari game, this is your chance. The rakish lid is your most dashing feature. I'm not sure, but I think my hat has been shot through by more than one Robo-Droid blast. Take that, sweetheart...

creative computing
SOFTWARE PROFILE

Name: Shamus

Type: Arcade adventure

System: Atari 400/800 16K

Format: Cassette/disk

Language: Machine

Summary: Another stride in "arcade adventuring"

Price: $29.95

Manufacturer:
Synapse Software
820 Coventry Rd.
Kensington, CA 94707

Once in a while during your search you will encounter a pulsating question mark, the function of which is similar to "Chance" in Monopoly. By touching the punctuation mark you invite extra points and extra lives or ill fortune. I have found it hard to resist them in the long run.

To advance to a higher level, you must obtain the correct keys and unlock the correct portals. This calls not only for keen aim of your weapon, but knowledge of the labyrinthian layout of each maze. Secret passages abound, and it is quite easy to get lost. The bottom of the screen reads out a corresponding number for each room, and this is the only hint you get. I always seem to disorient myself right after unlocking a portal.

Your natural tendency is to shower attackers with ion fire. After a few games, however, you discover that fewer but better aimed shots will nearly always be a superior strategy. Keep cool, and if you find any bubbling flasks lying around, drain them: they will give you new life.

You will notice a couple of familiar tunes recurring throughout the game: one is from the old "Dragnet" series, and the other, if I remember correctly, is from "Get Smart."

Shamus is a very addictive detective game. It will remain in the front of your game software collection for some time, I guarantee it. Arcade adventuring is an emergent and promising gaming category, and this program underscores that fact. ☐

---

31. What word describes our best-selling adventure series?

?

With our help, adventurers throughout the world have experienced space and time travel, classical mythology, murder, mystery and magic!
From fantasy role-playing and Hi-Res color graphics, to the largest of all existing adventure games, Sierra On-Line has consistently created "FIRSTS" in the industry.
We were the FIRST to successfully have an adventure game remain in Softalk's TOP THIRTY for over a year.
We were the FIRST to create the largest Hi-Res adventure game for any microcomputer.
Now, what word describes Sierra On-Line's best-selling adventure series? Our very name will give you a clue . . .

Sierra ON-LINE INC

36575 MUDGE RANCH ROAD COARSEGOLD, CA 93614
TLX 910 362 5025 209 683 6858

32. What name illustrates the best-selling arcade line from Sierra On-Line Inc.?

?

There's more to our arcade games than meets the eye. MORE excitement, more frustration and MORE challenge for your money. We offer you MORE than just a few hours of enjoyment. We give you superior programming, animation and high-level competition to keep you coming back for dare we say . . . more! Find out the answer and you will see why we are setting the pace in the industry!

Sierra ON-LINE INC

36575 MUDGE RANCH ROAD COARSEGOLD, CA 93614
TLX 910 362 5025 209 683 6858

A microprocessor in every component of this price-is-no-object stereo hi-fi system.

creative computing equipment evaluation

Bang & Olufsen Beosystem 8000

David H. Ahl

In the past, a few readers have taken me to task for doing reviews of hi-fi equipment. "After all," said one reader good-naturedly, "what credentials do you have to do hi-fi reviews?"

He was right. Although my fifth year EE project at Cornell was in acoustics and I worked briefly for Alcor, an innovative speaker manufacturer in the late 50s, this hardly qualifies me as an expert reviewer of hi-fi equipment.

On the other hand, I believe I am a rather discerning listener and user. I regularly attend symphony concerts at Lincoln Center and Symphony Hall in Newark, and outdoor concerts at Waterloo Village, Delaware Water Gap, and other locations. In addition, when travelling, I always make an attempt to attend local performances of interest. For example, last week in Washington I heard the U.S. Marine Band perform at the Jefferson Memorial.

Hence, in evaluating a hi-fi component or system I look for three things: 1) realistic sound reproduction, i.e., how does the sound compare with the original? 2) User friendliness, i.e., ease of installation and use. 3) Innovative technology. Obviously, my main interest is to see the various ways in which microcomputers and microprocessors are being used to advantage in other consumer products.

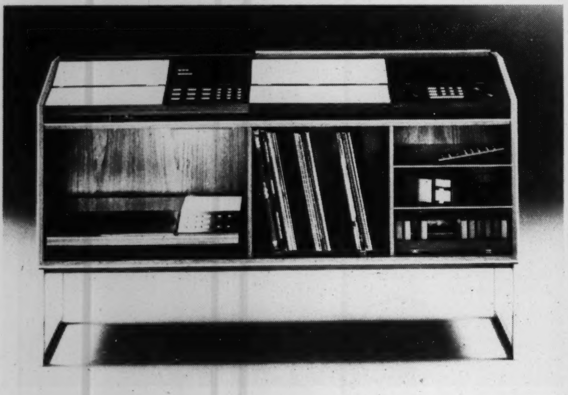
Obviously, we can't afford a great amount of space for this sort of thing in *Creative Computing*. After all, if you want hi-fi reviews, you should be reading *Stereo Review*. However, from time to time we will try to review innovative products of excellence on these pages. Hence, it was with more than passing interest that I read the letter from Fran Dym of Bang & Olufsen's public relations agency. Fran had seen my reviews of the dbx 20/20 Equalizer, KLH computer controlled speakers, Advent Sound Space control, etc., and wondered if I would be interested in reviewing the Bang & Olufsen Beocord 9000 cassette recorder. I was excited at the possibility but found it hard to imagine reviewing a component that cost nearly as much as the rest of my system combined. I called Fran and told her that, to which she replied, "Why don't we send you the entire system?"

Good Grief! This was an offer I couldn't possibly refuse.

I had seen and heard the Bang & Olufsen Computer Controlled Beosystem 8000 at the last Consumer Electronics Show and was most impressed by its performance. Here, however, was the opportunity to try it in a more realistic listening environment as well as get the reaction of other people to the system.

In due time three massive cartons arrived—no stereo compact this. The receiver and cassette deck are about one-third again larger than other "standard size" stereo components. The turntable is about the same size. The components are connected to one another by means of DIN plugs on shielded cables supplied with the system. For those using just one component with other standard components, cables with RCA-type phonojacks are provided.

Initially, the instruction manuals appeared as formidable as the many controls on the components. The manual for the overall system runs 54 pages while the manuals for individual components run between 8 and 26 pages. Each component also includes a complete wiring diagram and a bright red booklet, "Safety Instructions," which deals with such things as ventilation, heat, antenna grounding, and the like.



Beosystem 8000 as pictured in Bang & Olufsen press release photo.

Beosystem 8000 as initially set up in my living room for this evaluation.

BE A WINNER ALL YEAR LONG

WITH

SIERRAVISION SIERRAVENTURE

SIERRA BUSINESS PRODUCTS

Three Grand Prize Winners $500 Worth of Software

It's true! Be a WINNER ALL YEAR LONG and become eligible to be one of three GRAND PRIZE WINNERS in SIERRA ON-LINE'S WINNERS CONTEST! We at ON-LINE SYSTEMS are proud to announce our new name, SIERRA ON-LINE INC. Due to the rapid growth our company has experienced since its inception, it has come time to choose a name and symbol which represent our company's philosophy . . . STABILITY, QUALITY AND DEPENDABILITY. Now that you've been introduced to our new name, here's your chance to become better acquainted. Each one of our ads in this magazine asks an important question concerning that particular product. If you can correctly answer all thirty-two questions and return your entry by March 15, 1983 you could be one of three GRAND PRIZE WINNERS! Each Grand Prize Winner will select $500 worth of action-packed software from Sierra On-Line's vast product line! In addition to the three Grand Prize Winners, all entries will be eligible for our year-long drawing. Every time Sierra On-Line Inc. releases a new Apple product during the year 1983, TEN WINNERS will be randomly drawn to receive that product free. You need enter only once and you're eligible all year long, not to mention the chance to win $500 worth of software! Just pick up an entry form from your local computer store and correctly answer the thirty-two questions and return it to us by the given date and you could be a Grand Prize Winner! Join us in our continuing celebration of the new year and become a WINNER ALL YEAR LONG with quality Apple software products from Sierra On-Line, the leader in the field.

Just follow the rules listed below.

OFFICIAL CONTEST RULES:

All federal, state and local taxes are the sole responsibility of the winner. This game is void where prohibited, license required or taxed (other than a tax on prizes awarded).

Contest begins on JANUARY 18, 1983. All entries MUST be postmarked by MARCH 15, 1983.

WINNERS will be notified by mail. Public notice of WINNERS will be printed in this and other computer magazines.

Only ONE entry per person please, all duplicates will be discarded.

There will be TEN WINNERS each time a NEW Sierra On-Line product is released for the Apple computer.

Official Entry Forms are available at a dealer near you! Sorry, contest is limited to the United States of America and properties thereof.

Sierra ON-LINE INC

36575 MUDGE RANCH ROAD COARSEGOLD, CA 93614
TLX 910 362 5025 209 683 6858

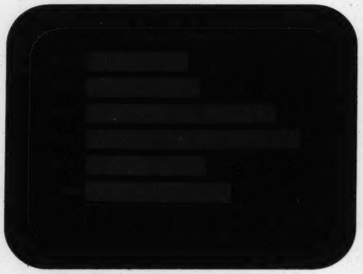
CIRCLE 258 ON READER SERVICE CARD

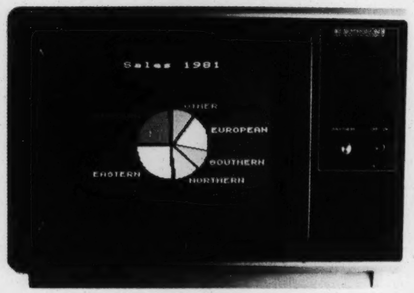
Not all business
And we've got the

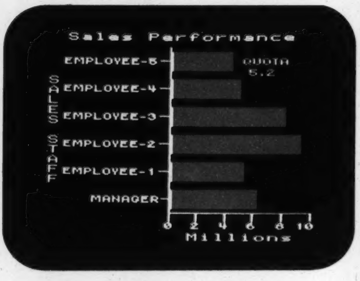
As you know, one picture is worth a few thousand numbers.

As you may not know, Apple® Business Graphics software can generate more types of pictures, in more colors, using more data than any other graphics package.

So you not only get the usual bar graphs and pie charts. You also get unusual bar graphs and pie charts. Sophisticated line and area graphs. Even scattergrams. All teamed with extremely useful and powerful features—exploded views, unlimited overlays, floating titles and more.

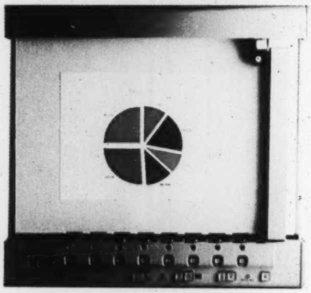


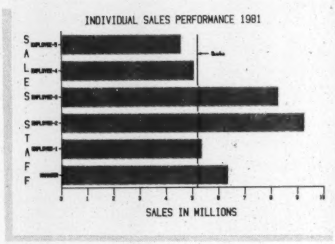




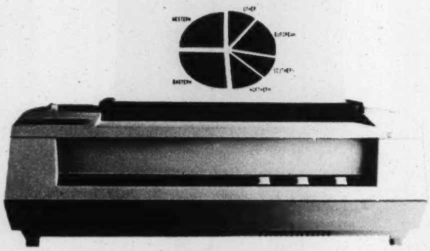
	Apple	VisiTrend/ VisiPlot	pfsGraph
Graph Types			
Line	Yes	Yes	Yes
Vertical Bar	Yes	Yes	Yes
Horizontal Bar	Yes	No	No
Side-by-side Bar	Up to 4	2	4
Pie	Yes	Yes	Yes
Partial Pie	Yes	No	No
Scattergram	Yes	Yes	No
Curve Fitting	5 Kinds	1	None
Data Points (Max.)	3500+	645	36
Plotter Compatible	Virtually Any	None	H-P7470A Only
Compatible File Types	Pascal BASIC VisiCalc	BASIC VisiCalc	pfs VisiCalc
Math Functions	Yes	Yes	No
Available Colors	6	4	4

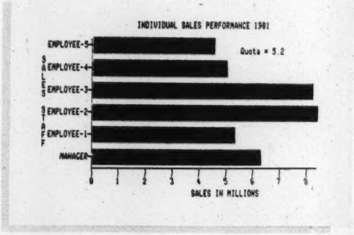
Apple Business Graphics is available for both the Apple II and Apple III.



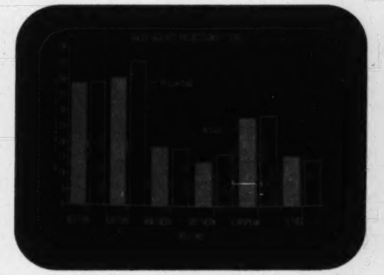


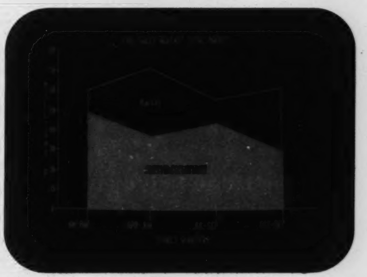
Equally important, with our graphics package you'll find more ways to see what you're doing. On the monitor of your choice. And on virtually any printer or plotter on the market.

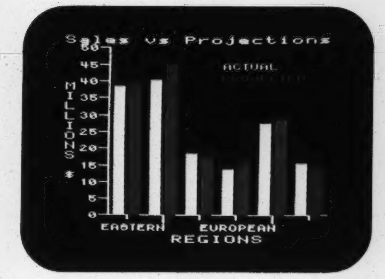


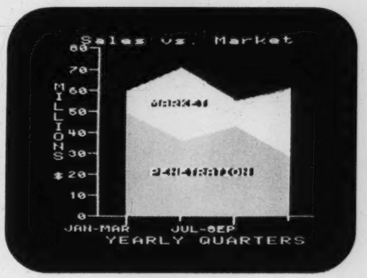


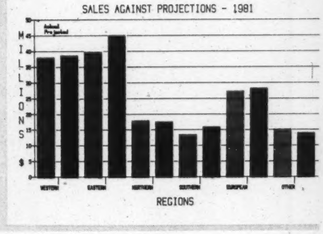
graphics are alike.
pictures to prove it.

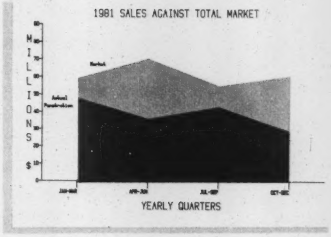


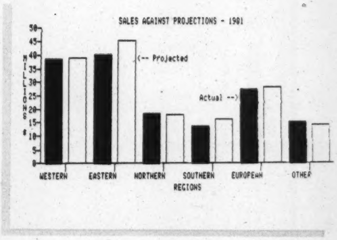


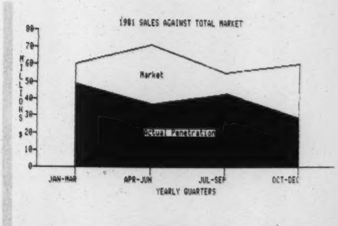












Even on transparencies and slides (by combining Apple Business Graphics with packages like Screen Director™ and Target Image Maker™).

All of which makes for more presentable presentations. And more revealing market analyses, forecasts, budgets, stock trends, business plans or customer demographics.

Or the information of your choice from the files of your choice. Be it VisiCalc,® Pascal, DIF or BASIC.

We could easily tell you more.

But we'd rather show you more. In person. At any of our over 1300 full-support dealers (they also offer a vast library of other quality software distributed by Apple for Apples).

Apple
Apple Business Graphics
X↔Y

So pay one a visit. And find out how easy it is to turn a sea of data into data you can see.

apple®

The most personal software.

Call **(800) 538-9696** for the location of the authorized Apple dealer nearest you, or for information regarding corporate purchases through our National Account Program. In California **(800) 662-9238.** Or write Apple Computer Inc., Advertising and Promotion Dept., 20525 Mariani Ave., Cupertino, CA 95014.

Screen Director is a trademark of Business Professional Software, Inc. Target Image Maker is a trademark of Comshare Target Software. VisiCalc is a registered trademark of VisiCorp.

CIRCLE 112 ON READER SERVICE CARD

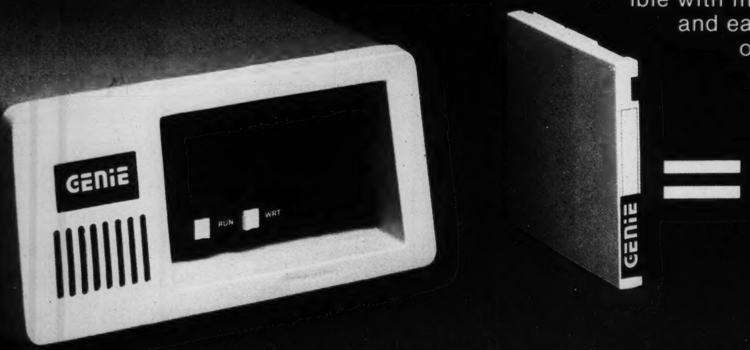
Introducing

GENIE® 5+5

5.25″ Fixed/Removable GENIE Cartridge Drives

I.B.M. • APPLE II • RADIO SHACK

The Genie Cartridge Drive is a revolutionary new 10 Megabyte Hard Disk Drive that includes a 5 Megabyte removable cartridge. The cartridge Drive system simply plugs into your computer, and includes all necessary software and hardware. Genie drives are compatible with most popular software, and each cartridge replaces over 30 double-density floppy disks.



FEATURES

- 10 Megabytes of on-line storage.
- File sizes to 5 Megabytes.
- Power-on self-test.
- Easy back-ups in minutes.
- System expandable to eight drives.
- Built-in error detection and correction.
- No preventative maintenance required.
- Comes complete with all necessary software and hardware.
- MTBF 8000 Hours.
- Built-in fan.
- Operates 110/220 VAC 50-60 Hz.
- One year limited warranty.

Removable Cartridge. Imagine, 5 Megabytes in the palm of your hand. These small cartridges are only .75 inches thick and 5.50 inches square. The disk itself is completely sealed from the outside and all its hazards by a sliding door that opens only once the cartridge is firmly seated inside the drive. Long term availability of this cartridge is assured by its adoption by several well known manufacturers including **Dysan,** the world leader in computer mass storage media.

Only **$3995.00***

Available at your local computer dealer

GENIE®

COMPUTER CORPORATION

31127 Via Colinas #802
Westlake Village, CA 91362
(213) 991-6210

*Manufacturer's suggested retail price. Includes all required components.
IBM Personal Computer is a registered trademark of IBM Corporation.
Apple is a registered trademark of Apple Computer, Inc.
Radio Shack is a registered trademark of Tandy Corporation.

VISA master charge

CIRCLE 177 ON READER SERVICE CARD

Beoystem 8000, continued...

Beomaster 8000 Receiver

The heart of the Beosystem 8000 is the Beomaster 8000 receiver. The Beomaster has plenty of power—100 watts per channel with 8-ohm speakers or 150 watts with 4-ohm speakers. Although volume levels of 20 watts are more than enough to drive the average listener from his living room, the additional power is important because of distortion. Music, particularly classical music, contains a broad spectrum of frequencies and a wide dynamic range. To reproduce the full scope of this sonic information accurately, especially at high volume levels, requires an amplifier with generous and stable power. When this power is lacking, clipping distortion occurs.

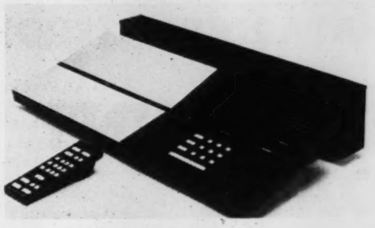
Even when this distortion is not particularly audible, it limits the dynamic response of the music, weakening the recreation of the original performance. For the normal home listening environment, or even a small auditorium, the Beomaster 8000 provides plenty of power to virtually eliminate clipping distortion.

However, it is in the tuner section where Bang & Olufsen's expertise really shines. The tuner features what is known as "digital frequency synthesizer construction." That long description means that FM tuning is accomplished with the aid of an internally generated reference frequency created by the vibration of a quartz crystal.

This frequency synthesis is then united with an innovative system of error-free automatic fine tuning. When the control is activated, the tuner will automatically lock on to the actual transmitted frequency of the FM station. This means that regardless of the drift of frequency or unstable reception conditions, the tuner will continue to follow the actual transmitted frequency with high accuracy.

The Beomaster 8000 receiver has two control sections: primary and secondary. The primary controls are located on the right front panel and, in most cases, are all that one would need for operating the system. The secondary controls are located beneath a brushed aluminum cover on the left rear of the system which raises upon pressing the word "programming." Also under this panel is a hinged access panel which conceals the input and output connectors for the receiver. For connecting to other B & O components, special 7-pin DIN sockets and cord sets are used. These carry the input signals as well as allowing communication between the microcomputer of the Beomaster with that of the turntable and cassette deck.

The expected two sockets are provided for an FM antenna: one for an antenna with 240-300 ohm impedance (included) and a coax input for an antenna with 60-75 ohms impedance. Unfortunately, neither connector conforms to U.S. standards and if you elect to use the 75-ohm coax imput, as I did, you are in for some trouble. Although the socket looks like a male F connector (U.S. receivers would provide a female F connector) in reality it is slightly smaller than an F connector and no amount of cussing will make it fit.



B & O furnishes a female connector for the FM input which connects directly to coax cable. It was not at all obvious how the cable shield was supposed to be attached nor was this mentioned in the instructions. Presumably if you get a B & O system, these are things the dealer will handle.

The speaker connectors are tricky little buggers which must be permanently attached to the end of your speaker cables.

The primary controls consist of 13 buttons and 2 wheels. All are set flush into the surface of the receiver. The free-turning wheel on the left controls volume. It can be adjusted over a range 60 increments of 1.5 dB each. An LED digital display shows the current volume setting. The display is on the right of the receiver above the control section behind dark plexiglass.

A companion control to volume, but in the secondary control area, is balance. After you have adjusted volume and balance to a preferred level, you can then press the "store" button and these levels will be stored in the memory of the microcomputer. Thereafter, each time your system is turned on it will return to the same volume and balance settings.

The twelve touch buttons in the center of the primary control panel are for selection of inputs. One selects phono, two select tape, and the other nine select nine preset FM frequencies from the tuner section.

The large tuning wheel on the right side of the control panel is used to tune FM stations. The frequency being received is shown in a large LED display above the tuning wheel. A station may be preset by simply tuning to the right station, pressing "FM Store" in the programming section and pressing one of the buttons, P1-P9.

The last button in the primary control section is used for turning the receiver off. To turn it on, you simply press the input selection that you desire.

The receiver also has the expected bass and treble controls, loudness compensation switch, stereo/mono switch, high pass filters, tape monitor switch, and tuning mute switch. Putting some of these into service lights an appropriate indicator in the display section.

One switch, found on few other systems, allows the FM signal strength meter to show the strength of a multi-path signal. In other words, this could indicate that your FM transmission is being affected by reflected signals from high buildings, a hillside, or other barriers. To minimize the distortion caused by such reflections, you can adjust your FM antenna using this meter as a guide.

Another rarely found indicator in the display section lights up if the volume is increased to such levels that clipping distortion will occur at peaks in the music. This does not indicate that any damage is being done (except, perhaps to your ears) but that clipping distortion is occurring.

A phone jack (standard) is provided on the front of the unit for stereo headphones. In addition, a pair of RCA phone jacks are available on the left side for connecting other audio components such as an equalizer, expandor, or the like. I did not try this with my KLH computer-controlled speakers although the combination should work.

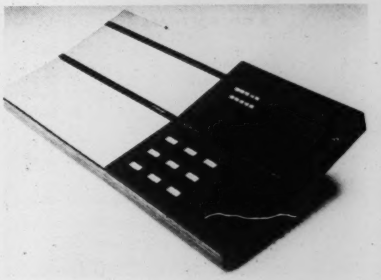
Although a tuner, cassette deck, and turntable are the most common input devices for a hi-fi system, I was disappointed that the designers did not provide for any addtional input devices, such as a laser disc player, computer synthesizer, or component TV system. I feel that a receiver that is obviously designed with years of service in mind ought to anticipate that more electronic audio devices are coming down the road.

I was also surprised to find no additional auxillary power outlets on the receiver. Unfortunately, this system requires a separate wall outlet or equivalent for each component.

Beocord 9000 Cassette Recorder

The Beocord 9000 is by far and away the most sophisticated hi-fi component which I have ever touched. The performance is nearly unbelievable, but let me take you on a guided tour of the deck and its controls before getting to that.

Upon turning on the deck, the first



ATARI·TRS-80·APPLE·ATARI·IBM·XEROX·PET·VIC·NEC·CP/M

XEROX·TRS-80·APPLE·ATARI·IBM·XEROX·PET·VIC·NEC·CP/M·TRS-80·APPLE·ATARI

DISCOUNT DATA PRODUCTS

THINK ABOUT CHRISTMAS NOW!
THE PERFECT PRESENT
A GIFT CERTIFICATE FROM DISCOUNT DATA PRODUCTS
GIVE US A CALL!

COMPUTER STORE SERVICE AT MAIL ORDER PRICES

APPLE

		LIST PRICE	OUR PRICE
★ ACCENT SOFTWARE			
ADVENTURE INTERNATIONAL			
Commbat	D	24.95	19.95
Rear Guard	D	29.95	**20.97‡**
Tunnel Terror	D	29.95	23.95
War	D	24.95	19.95
S.A.G.A. #1-12 each	D	29.95	23.95
★ APPLIED SOFTWARE TECHNOLOGY			
★ ARTSCI ★ ASHTON-TATE			
★ ASTAR INTERNATIONAL CO.			
AUTOMATED SIMULATIONS			
Temple of apshai	D	39.95	31.95
Crush, Crumble & Chomp	D	29.95	23.95
Upper Reaches of Apshai	D	19.95	**13.97‡**
★ AVALON HILL GAME COMPANY			
AVANT-GARDE CREATIONS			
HI-RES Secrets	D	125.00	99.95
HI-RES Computer Golf	D	29.95	23.95
BEAGLE BROS.			
DOS Boss	D	24.00	19.20
Utility City	D	29.50	23.50
Alpha Plot	D	39.50	**27.69‡**
Tip Disk #1	D	20.00	15.95
Apple Mechanic	D	29.50	23.95
★ BEZ			
BRODERBUND SOFTWARE			
Apple Panic	D	29.95	23.95
The Arcade Machine	D	44.95	35.95
Star Blazer	D	31.95	25.50
Choplifter	D	34.95	27.95
Serpentine	D	34.95	27.95
HI-RES ADv. #1 - Dead. Sec.	D	34.95	27.85
Sea Fox	D	29.95	23.95
Hard Hat Noah	D	29.95	23.95
★ BUDGECO			
CALIFORNIA PACIFIC			
Bill Budge's 3D Graphics	D	39.95	31.95
Ultima	D	39.95	31.95
CAVALIER COMPUTER			
Bug Attack	D	29.95	23.95
Microwave	D	34.95	27.95
★ COMSHARE TARGET			
CONTINENTAL SOFTWARE			
The Home Accountant	D	74.95	59.95
1st Class Mail	D	74.95	59.95
CPA Modules #1-4 (each)	D	250.00	199.95
★ CPU SOFTWARE			
DAKIN 5/LEVEL 10			
Worm Hole	D	29.95	23.95
DATAMOST			
Snack Attack	D	29.95	23.95
Thief	D	29.95	23.95
Swashbuckler	D	34.95	**24.47‡**
Money Muncher	D	29.95	23.95
Vortex	D	29.95	23.95
Pandora's Box	D	29.95	23.95
DATASOFT			
Tumble Bugs (Dung Beetles)	D	29.95	23.95
★ DENVER SOFTWARE			
★ DON'T ASK SOFTWARE			
★ DOUBLE GOLD SOFTWARE			

		LIST PRICE	OUR PRICE
EDU-WARE			
Statistics	D	29.95	23.95
Spelling Bee w/Read. Primer	D	39.95	31.95
Algebra 1	D	39.95	31.95
Algebra 2	D	39.95	31.95
Rendevous	D	39.95	31.95
GEBELLI SOFTWARE			
Zenith	D	34.95	27.95
Phaser Fire	D	29.95	23.95
High Orbit	D	29.95	23.95
★ HAYDEN SOFTWARE			
★ HAYES MICROCOMPUTER PRODUCTS			
★ HIGHLANDS COMPUTER SERVICES			
HOWARD SOFTWARE			
Creative Financing	D	195.00	155.95
NY/NJ State Tax	D	75.00	59.95
California State Tax	D	75.00	59.95
Tax Preparer '82	D	150.00	**104.95‡**
INFOCOM			
Zork I	D	39.95	31.95
Zork II	D	39.95	31.95
Deadline	D	49.95	39.95
★ INNOVATIVE DESIGN SOFTWARE			
INSOFT			
GraForth II	D	75.00	**52.50‡**
Electric Duet	D	29.95	23.95
★ ISM ★ IUS ★ LAZER SYSTEMS			
KENSINGTON MICROWARE LTD.			
System Saver	A	89.95	71.95
LIGHTNING SOFTWARE			
Master Type	D	39.95	31.95
MICRO LAB			
Wall Streeter	D	300.00	239.95
MICROSOFT			
Olympic Decathlon	D	29.95	23.95
Typing Tutor II	D	24.95	19.95
TASC Compiler	D	175.00	139.95
FORTRAN-80	D	195.00	154.95
A.L.D.S.	D	125.00	99.95
SoftCard	A	395.00	336.95
MICROTEK			
BAM 16K Memory Board	A	139.95	119.85
Apple Parallel Inter	A	139.95	119.85
MUSE			
The Voice	D	39.95	31.95
Three Mile Island	D	39.95	31.95
Robot War	D	39.95	31.95
Castle Wolfenstein	D	29.95	23.95
Supertext 40/56/80	D	125.00	99.95
ON-LINE SYSTEMS			
HI-RES Adv. #2 - Wiz & Prin.	D	32.95	26.35
HI-RES Adv. #3 - Cranston M.	D	34.95	27.95
HI-RES Adv. #4 - Ulysess	D	34.95	27.95
HI-RES Adv. #5 - Time Zone	D	99.95	79.96
Mouskattack	D	34.95	27.95
Ultima II	D	59.95	**41.97‡**
Threshold	D	39.95	31.95
The Dictionary	D	99.95	79.95
Screenwriter II	D	129.95	98.95
Pest Patrol	D	29.95	23.95
Lunar Leeper	D	29.95	23.95
The Artist	D	99.95	79.95
Frogger	D	34.95	27.95

		LIST PRICE	OUR PRICE
E.P.F. IV	D	79.95	63.95
Cannonball Blitz	D	34.95	27.95
Expediter II +	D	135.95	108.75
General Manager	D	149.95	**104.97‡**
Screenwriter Pro. System	D	199.95	159.95
★ PEACHTREE			
PENGUIN SOFTWARE			
Complete Graphics Sys.	D	69.96	55.96
Special Effects	D	39.95	31.95
Graphics Magician	D	59.95	47.95
PICCADILLY			
Star Blaster	D	29.95	23.95
Ribbit	D	29.95	23.95
PHOENIX SOFTWARE			
The Birth of the Phoenix	D	22.00	17.50
Zoom Grafix	D	39.95	31.95
QUALITY SOFTWARE			
Bag of Tricks	D	39.95	31.95
Beneath Apple DOS	B	19.95	15.95
Ali Baba & 40 Thieves	D	32.95	26.35
SENSIBLE SOFTWARE			
Super Disk Copy III	D	30.00	23.95
Multi Disk Catalog III	D	25.00	19.95
Disk Recovery	D	30.00	23.95
Applesoft Program Opti	D	20.00	15.95
Disk Organizer II	D	30.00	20.95
DOS Plus	D	25.00	19.95
Quickloader	D	25.00	19.95
Image Printer - Epson	D	40.00	31.95
Sensible Speller	D	125.00	99.95
Sensible Speller (Super Text)	D	125.95	99.95
Sensible Spel (Apple CP/M)	D	125.95	99.95
B.E.S.T.	D	40.00	31.95
SENTIENT SOFTWARE			
Cyborg	D	32.95	26.50
Congo	D	34.95	27.95
Goldrush	D	34.95	27.95
SIRIUS SOFTWARE			
Kabul Spy	D	34.95	27.95
Minotaur	D	34.95	27.95
Bandits	D	34.95	27.95
Escape From Rungistan	D	29.95	23.95
The Joyport	A	74.95	**52.47‡**
Freefall	D	29.95	23.95
Way Out	D	39.95	31.95
SIR-TECH SOFTWARE			
Wizardry	D	49.95	39.95
Knight of Diamonds (sc. #2)	D	34.95	27.95
SOFTWARE PUBLISHING CORP.			
PFS: Report (New Improved)	D	95.00	76.95
PFS: (New Improved)	D	125.00	99.95
PFS: Graph	D	125.00	99.95
★ SOUTHEASTERN SOFTWARE			
SOUTHWESTRN DATA SYSTEMS			
Ascii Pro	D	129.95	103.95
Correspondent	D	59.95	47.95
Merlin	D	64.95	51.95
The Routine Machine	D	64.95	51.95
Z-Term "The Pro"	D	150.00	119.95
P-Term	D	129.95	103.95
Munch-A-Bug	D	49.95	39.95

XEROX·TRS-80·APPLE·ATARI·IBM·XEROX·PET·VIC·NEC·CP/M

TRS-80·APPLE·ATARI·IBM·XEROX·PET·VIC·NEC·CP/M·APPLE·ATARI·IBM·XEROX·PET·VIC·NEC·CP/M·APPLE·ATARI·IB

STONEWARE PRODUCTS			
D.B. Master	D	229.00	183.20
D.B. Master Utility Pak #1	D	99.00	79.95
D.B. Master Utility Pak #2	D	99.00	79.95
D.B. Master Stat Pac	D	99.00	79.95
★ STRATEGIC SIMULATIONS			
SUBLOGIC			
Flight Simulator (A2-FS1)	D	33.50	26.80
Pinball (A2PB1)	D	29.95	23.95
Graphics Combo Pkg	D	119.85	95.96
SYNERGISTIC SOFTWARE			
Atlantis	D	40.00	31.95
Higher Text II	D	40.00	31.95
Higher Graphics II	D	35.00	27.95

Nightmare Gallery	D	34.95	27.95
Global Program Line Editor	D	64.95	51.95
★ SYSTEMS PLUS			
TG PRODUCTS			
Game Paddles	A	39.95	31.95
Joystick	A	59.95	47.95
Select-A-Port (5 Way)	A	59.95	47.95
★ TURNKEY SOFTWARE			
★ UNITED SOFTWARE OF AMERICA			
★ VERSA COMPUTING			
VIDEX INC.			
Videoterms (60 hz)	A	345.00	289.95

Enhancer II (Rev 7 & up)	A	149.00	119.95
Function Strip	A	79.00	63.20
VISICORP			
VisiPlot	D	200.00	159.95
VisiTrend/Plot	D	300.00	239.95
VisiDex	D	250.00	199.95
VisiTerm	D	100.00	79.95
VisiCalc 3.3	D	250.00	199.95
VisiFile	D	250.00	199.95
VisiPak	D	700.00	567.95
VisiSchedule	D	300.00	239.95
WAYCO			
Track Ball	A	79.95	63.95
★ ZEITGEIST			

ATARI

		LIST PRICE	**OUR PRICE**
ADVENTURE INTERNATIONAL			
Adventures #1-3	32K D	39.95	31.95
Commbat	D	24.95	19.95
Rear Guard	24K D	24.95	**17.47‡**
Preppie	D	29.95	23.95
War	D	24.95	19.95
Diskey	D	49.95	39.95
ARCADE PLUS			
Ghost Hunter	16K D	34.95	27.95
ARcade Pro Football	24K D	34.95	**24.47‡**
★ARTSCI			
ATARI INCORPORATED			
Work Processor	48K D	149.95	119.95
Personal Finance Mngmt	32K D	74.95	59.95
Caverns of Mars	16K D	39.95	31.95
Dow Jones Invest. Eval.	48K D	129.95	103.95
Microsoft Basic	32K D	89.95	71.95
Macro Assem & Text Ed	32K D	89.95	71.95
Mailing List	24K CT	24.95	19.95
The Programmer Kit	8K CT	79.85	63.95
The Entertainer Kit	8K CT	89.95	71.95
Asteroids	8K CT	34.95	27.95
Assembler Editor	8K CT	59.95	47.95
Missile Command	8K CT	34.95	27.95
Centipede	8K CT	44.95	35.95
Pac Man	8K CT	44.95	35.95
PILOT (Home Package)	8K CT	79.95	63.95
Technical User Notes	B	29.95	23.95
Joysticks (Pair)	A	21.95	17.56
Paddles (Pair)	A	21.95	17.56
16K RAM Memory Module	A	99.95	79.95
AUTOMATED SIMULATIONS			
Temple of Apshai	32K D	39.95	31.95
Crush, Crumble, Chomp	32K D	29.95	23.95
★ AVALON HILL GAME COMPANY			
BRODERBUND SOFTWARE			
Apple Panic	48K D	29.95	23.95
David's Midnight Magic	D	34.95	27.95
Track Attack	D	29.95	23.95
Star Blazer	D	31.95	25.55
HI-RES Adv. #1 Dead. Sec.	D	34.95	27.95
Choplifter	D	34.95	27.95
BUDGECO			
Raster Blaster	32K D	29.95	23.95
CAVALIER			
Bug Attack	16K D	29.95	**20.97‡**
Bug Attack	16K C	29.95	**20.97‡**

		LIST PRICE	**OUR PRICE**
DATASOFT			
Text Wizard	32K D	99.95	79.95
Datasm 65 2.0	48K D	89.97	71.95
Micropainter	48K D	34.95	27.95
Color Print	40K D	39.95	31.95
Tumble Bugs	24K D	29.95	23.95
Graphics Master	40K D	39.95	31.95
Graphic Generator	D	24.95	19.95
The Basic Compiler	D	99.95	79.95
Canyon Climber	16K D	29.95	23.95
Shooting Arcade	D	29.95	23.95
Pacific Coast Highway	D	29.95	**20.97‡**
Clowns & Balloons	D	29.95	23.95
Le Stick	A	39.95	31.95
Color Print Refill	A	15.95	12.75
DON'T ASK SOFTWARE			
Wordrace	32K D	24.95	19.95
★ EDU-WARE			
GEBELLI			
Andromeda	24K D	34.95	27.95
Pathfinder	D	34.95	27.95
Dr. Goodcode's Cavern	48K D	29.95	23.95
INFORCOM			
Deadline	32K D	49.95	39.95
Zork I	32K D	39.95	31.95
Zork II	32K D	39.95	31.95
IN-HOME SOFTWARE			
Alien Swarm	16K D	34.95	27.95
Intruder	16K D	34.95	27.95
INNOVATIVE DESIGN SOFTWARE			
Pool 1.5	48K D	34.95	27.95
Pool 400	C	39.95	31.95
JV SOFTWARE			
Action Quest	16K D	29.95	23.95
★ K-BYTE ★ LJK			
MEGASOFT INC.			
Megalegs	16K C	34.95	27.95
ON-LINE SYSTEMS			
HI-RES Adv. #0	40K D	24.95	19.95
HI-RES ADv. #2	40K D	32.95	26.35
Crossfire	32K D	29.95	23.95
Mousekattack	32K D	34.95	27.95
Ultima II	D	59.95	47.95
Jawbreaker	16K D	29.95	23.95
Threshold	40K D	39.95	31.95
Softporn Advenure	40K D	29.95	23.95
The Next Step	32K D	39.95	31.95
Frogger	D	34.95	27.95

		LIST PRICE	**OUR PRICE**
Ultima I	D	39.95	31.95
Frogger	C	34.95	27.95
★ OPTIMIZED SYSTEMS SOFTWARE INC.			
PRISM COMPUTERS			
Galactic Chase	16K D	29.95	23.95
QUALITY SOFTWARE			
Ali Baba and 40 Thieves	32K D	32.95	26.35
Assembler	16K C	24.95	19.95
ROKLAN CORP			
Deluxe Invaders	16K D	34.95	27.95
Gorf	16K D	39.95	31.95
Wizard of Wor	16K D	39.95	27.97
Telecom	D	69.95	55.95
Gorf	CT	49.95	**34.97‡**
Wizard of Wor	CT	49.95	39.95
SIRIUS SOFTWARE			
Cyclod	D	29.95	23.95
Snake Byte	D	29.95	23.95
STRATEGIC SIMULATIONS			
The Shattered Alliance	48K D	39.95	31.95
Battle of Shiloh	48K D	39.95	31.95
Tigers in the Snow	48K D	39.95	31.95
SUBLOGIC			
Aventure on a Boat	32K D	24.95	19.95
Black Forest	48K D	24.95	19.95
SYNAPSE SOFTWARE			
File Manager 800	40K D	99.95	79.95
Disk Manager	32K D	29.95	23.95
Dodge Racer	32K D	29.95	23.95
Protector	32K D	29.95	23.95
Chicken	16K D	29.95	23.95
Nautilus	32K D	29.95	23.95
Slime	16K D	29.95	23.95
Protector	32K C	29.95	23.95
Nautilus	32K C	29.95	23.95
★ SYNCRO ★ SYNERGISTIC SOFTWARE			
UNITED SOFTWARE OF AMERICA			
Atari World	D	59.95	47.95
3-D Supergraphics	40K D	39.95	31.95
Survival/Adventure	32K D	24.95	19.95
VISICORP			
Visicalc	32K D	250.00	199.95
VERSA COMPUTING			
Graphics Composer	32K D	39.95	31.95
Globe Master	D	29.95	23.95
Graphics Composer	32K C	39.95	23.95
VersaWriter Graphics Tablet	A	299.00	239.95

TO ORDER 800-854-2914 • INSIDE CALIFORNIA & ALL OTHER INQUIRIES 1-714-287-0190

SEND FOR OUR FREE CATALOG LISTING ADDITIONAL SOFTWARE FOR ALL MAJOR COMPUTERS.
ALL SOFTWARE OFFERED HAS BEEN EVALUATED FOR PERFORMANCE.
PLEASE CHECK FOR SYSTEM REQUIREMENTS BEFORE ORDERING.
INCLUDE PUBLISHER AND PRODUCT NAME.
PURCHASE ORDERS ACCEPTED • FOREIGN INQUIRIES INVITED — ADD 10% SHIPPING.

All Orders Prepaid by Personal Check, Money Order, Cashier Check.
For Faster Delivery Service — Master Charge — Visa
Mastercharge — Visa, include expiration date on card.
Please Add $2.50 for Shipping.
California Residents Add 6% Sales Tax.
Specials Valid Through This Month's Issue.
Prices Subject to Change Without Notice.

30% DISCOUNT ON ‡ MONTHLY SPECIALS

DISCOUNT DATA PRODUCTS

P.O. BOX 19674-CK • SAN DIEGO, CALIFORNIA 92119

TRS-80·APPLE·ATARI·IBM·XEROX·PET·VI

M·NEC·PET

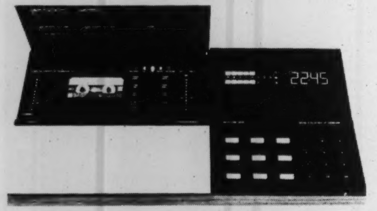
CIRCLE 180 ON READER SERVICE CARD

thing you notice is a large digital LED display (normally invisible behind black smoked plexiglass). Unlike those impossible mechanical counters found on most other tape decks, the digital display always shows the elapsed minutes and seconds of tape travel regardless of operating mode (playback, record, fast forward or rewind). I found it especially convenient to work with a system in real time rather than trying to guess how much tape was left or use a not-very-accurate watch like I have done so many times in the past. This feature alone may justify the cost of the deck.

In a sense, all the controls of the deck revolve around the timer. When you place a cassette in the Beocord and press Play or Record, the deck will automatically assign the time 00:00 to the starting point of the tape (by using the fast forward or reverse controls, you can shift the starting point if you wish). From then on all times on the cassette are shown relative to this starting point.

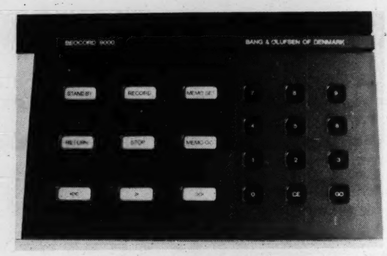
To calibrate any cassette, say a previously recorded one, to a real time index, you simply press the "Go" button on the control panel. The following operations then take place. The tape will rewind to the beginning, it will be advanced for approximately 12 seconds at playback speed while it is analyzed by the Beocord microprocessor. Then, at fast forward speed it will be advanced once again, shifted to playback speed and calibrated for an additional six seconds.

Once the calibration process is complete, the tape will automatically return to the location at which it was loaded when the cassette was inserted. Playback will then begin.



If you want playback to begin at a location well into the tape, say 10:25, you simply press 1025 on the front panel and then press Go. The tape will advance to that point and start playing.

I mentioned earlier that pressing "Go" will cause the Beocord to "analyze" the tape. What does this mean? The microprocessor runs through a short measurement process which takes into consideration all the physical characteristics of your cassette. A small data bank on this cassette is then created in the computer memory and a real time calibration takes place. Calibration is unique to each cassette and takes into account varying tape types (iron oxide, chrome, metal, etc.) and the thickness of the magnetic coating. Thus each time you insert a cassette the process begins again.



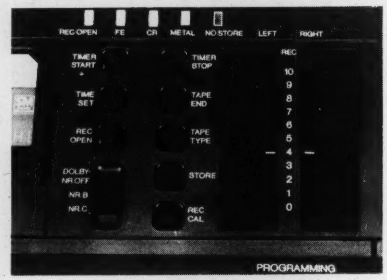
External control panel.

Another pair of control functions, for which I admit I found no practical use, is "Memory Set" and "Memory Go." In playback, pressing Memory Set on the control panel will place the present tape position in the Beocord memory. To return to that position at any time you simply press "Memory Go" and the Beocord will fast forward or rewind to that location and begin playback.

Much more useful was the "Return" button. Unlike Rewind which brings you to the beginning of the tape, Return causes the tape to rewind to the beginning of the last recorded segment. Thus, if you are recording from the record and get an annoying bit of static on one band, you need not return to the beginning of the side and start over. Rather, you can simply return to the beginning of the last selection. (This doesn't always work, since the Beocord is looking for four seconds or more of silence before it will stop.)

Where the deck really shines is in recording. To start a recording, you place your cassette in the deck and press "REC OPEN" in the programming section. This activates the recording circuitry and illuminates the corresponding indicator.

You then press "REC CAL." This initiates the tape calibration process. This takes approximately nine seconds during which time the Beocord will optimize its recording circuitry in relation to the bias, equalization, and sensitivity characteristics to the tape you are using. Also, an analysis of your tape distortion is made, and the electronic peak program meters are automatically calibrated to reflect the recording ability of your specific tape.



Internal control panel.

If you wish, you can store the calibration date of up to four tape types in the Beocord memory. This means that if you use the same brand and type of tape, you do not have to use the "REC CAL" process each time you insert a new cassette.

In the record mode, the timer will tell you not only how much time has elapsed since the beginning of the tape, but also how much time remains on the cassette you are using. No matter whether you are using the elapsed time or time remaining display, a "Tape End" warning will flash approximately five minutes before the end of your tape. It will continue to slowly flash until the end of the tape.

For those who like to know what's going on inside the recorder, the Beocord allows you to display some of the calibration data on the display panel. For example, you can look at the bias on the right and left channel, equalizing, sensitivity, and distortion level. I had fun finding out that TDK tape had a lower distortion level than Audio Magnetic which, in turn, was lower than DAK tape, which, in turn, was lower than Realistic (Radio Shack) Low Noise Tape. In fact, I had one old unbranded cassette that had calibration data so far removed from the standards that the Beocord refused to accept the data in memory.

The Beocord has an 8-level peak program meter (signal strength). This provides real time measurement of the input signal strength for both left and right channels. As with most recorders, you adjust the signal so that it is mostly in the green and the loudest peaks light up the first red indicator. However, the Dolby C and HX Professional circuitry allow recording a much wider dynamic range than most other recorders are capable. The HX circuit automatically delivers a constant, signal controlled bias current to the record head regardless of the varying signal strength or frequency content. This constant bias current means that every tape type gains in signal handling and capacity without increased distortion. This was originally developed by Bang & Olufsen and is now being licensed to other manufacturers by Dolby Laboratories. Basically, the signal is evaluated after all processing (noise reduction and equalization) so the adjustment is made on the basis of what is actually going on to the tape. The constant bias means that both high level high frequency signals as well as very low level signals will all go on to the tape at the same level of tape saturation. This minimizes saturation and even self-erasure. This explanation may sound like gobble-de-gook, but the sound on the tape is unbelievable. I recorded several 45 rpm digital records and could scarcely tell the difference on playback between

Franklin's ACE 1000 Runs With The Best!

VisiCalc®, DB Master®, Desktop Plan®—they are all running on the Franklin ACE 1000. Cash flow, budgets, word processing or data base management, business or pleasure, the ACE 1000 runs with the best.

The Franklin ACE 1000 is hardware and software compatible with the Apple® II. Franklin users can choose from an enormous selection of programs —programs that run better on the ACE because it includes 64K of RAM, upper and lower case, VisiCalc keys, a numeric pad and an alpha lock key.

Run with the best. Call or write today for the name of your local authorized Franklin dealer.

CIRCLE 196 ON READER SERVICE CARD

ACE 1000
DESKTOP PLAN-II
VISICALC

Franklin ACE is a trademark of Franklin Computer Corporation.
Apple is a registered trademark of Apple Computer Inc.
VisiCalc and Desktop Plan are registered trademarks of Visi Corp.
DB Master is a registered trademark of Stoneware.

FRANKLIN
COMPUTER CORPORATION

7030 Colonial Highway
Pennsauken, NJ 08109
609-488-1700

ABSOLUTELY RELENTLESS

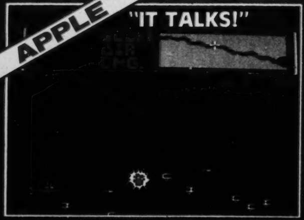
The challenge of inner space — the fury of an enemy that seemingly will not die. This is SEA DRAGON — a battle to the death **under** the high seas! Slide into the Captain's chair, take the controls and prepare yourself for the most incredible non-stop action this side of Davy Jones' locker. SEA DRAGON puts you in control of a nuclear sub that's armed from stem to stern with enough firepower to take on King Neptune himself — and you'll need every missile, every torpedo, and every scrap of skill you can muster to survive.

The object of SEA DRAGON is to successfully navigate your sub through an underwater course past mountains and through labyrinthine passageways while avoiding clusters of explosive mines that rise from the seabottom. But the danger doesn't stop there — overhead, surface destroyers lace the water with depth charges; below, deadly attack bases and arcing lasers cut a killing swath that could reduce your sub to bubbling slag. But even these potentially lethal perils are dwarfed by the awesome menace that awaits you at the course's end.

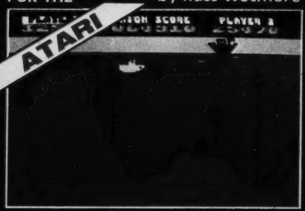
SEA DRAGON — every possible "extra" is here to ensure your playing pleasure: exciting sounds, high score save, machine language graphics and an eye-popping scrolling seascape that extends the equivalent of over two dozen screens placed end-to-end, providing a diverse and unique challenge that will not diminish after repeated playings.

Nothing you've ever seen on your micro could possibly prepare you for this! You are ready now, ready for the ultimate in undersea action with a pace that is absoutely unyielding. SEA DRAGON — the arcade has finally come home.

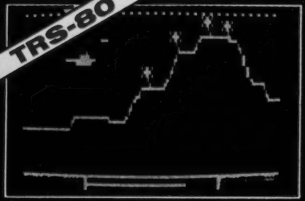
FOR THE **APPLE** by John Anderson



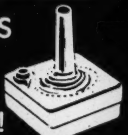
FOR THE **ATARI** by Russ Wetmore



FOR THE **TRS-80** by Wayne Westmoreland & Terry Gilman



ALL VERSIONS ARE JOYSTICK COMPATIBLE!



SEA DRAGON FEATURES

- Fantastic Scrolling Seascape
- Nearly Limitless Game Challenge
- High Score Save (disk version)
- Terrific Sound Effects
- Arcade Action Graphics™
- Apple version "talks" without special hardware!

ORDERING INFORMATION

Version	Number	Price
APPLE 2 or APPLE 2 PLUS 48K Disk (DOS 3.3 required)	042-0146	$34.95
ATARI 32K Disk	052-0146	$34.95
ATARI 16K Tape	051-0146	$34.95
TRS-80 32K Disk	012-0146	$24.95
TRS-80 16K Tape	010-0146	$24.95

Adventure INTERNATIONAL
A DIVISION OF SCOTT ADAMS, INC.

PRICES SUBJECT TO CHANGE

To order, see your local dealer. If he does not have the program, then call 1-800-327-7172 (orders only please) or write for our free catalog.

Published by ADVENTURE INTERNATIONAL
a subsidiary of Scott Adams, Inc.
BOX 3435 • LONGWOOD, FL 32750 • (305) 830-8194

CIRCLE 105 ON READER SERVICE CARD

WHEN YOU SIT DOWN TO A SCOTT ADAMS' GRAPHIC ADVENTURE . . .

NOW LOADING
SAGA
. . . ANYTHING
CAN HAPPEN!

That's right — anything can happen, and it usually does! Because with a Scott Adams Graphic Adventure, the fantastic is as close as your computer — and your own fertile imagination. Each S.A.G.A. features the finest in hi-resolution graphics — graphics which compliment and enhance the classic text — and, they can be toggled on or off with a single keystroke, too. Plus, optional Votrax Type 'N Talk™ and printer compatibility give you the flexibility to add new dimensions to your Adventuring — when you're ready.

The incomparable S.A.G.A. Series — experience the magic yourself. But be prepared for anything.

S.A.G.A. #1 — Adventureland (Skill Level: Moderate)		
APPLE 2 PLUS 48K Disk (DOS 3.3 req.) . .	042-0201	$39.95
ATARI 48K Disk	052-0201	$39.95
S.A.G.A. #2 — Pirate Adventure (Skill Level: Beginner)		
APPLE 2 PLUS 48K Disk (DOS 3.3 req.) . .	042-0202	$39.95
ATARI 48K Disk	052-0202	$39.95
S.A.G.A. #3 — Mission Impossible (Skill Level: Advanced)		
APPLE 2 PLUS 48K Disk (DOS 3.3 req.) . .	042-0203	$39.95
ATARI 48K Disk	052-0203	$39.95
S.A.G.A. #6 — Strange Odyssey (Skill Level: Moderate)		
APPLE 2 PLUS 48K Disk (DOS 3.3 req.) . .	042-0206	$39.95
ATARI 48K Disk	052-0206	$39.95

PRICES SUBJECT TO CHANGE

Also, look for the Scott Adams Text
Adventure Series on these fine computers:
TRS-80 • COMMODORE VIC • NEC PC-8001
TEXAS INSTRUMENTS 99/4 • CP/M Z-80

Adventure
INTERNATIONAL
A DIVISION OF SCOTT ADAMS, INC

To order, see your local dealer. If he does not have the program, then call 1-800-327-7172 (orders only please) or write for our free catalog.

Published by ADVENTURE INTERNATIONAL
a subsidiary of Scott Adams, Inc.
BOX 3435 • LONGWOOD, FL 32750 • (305) 830-8194

MORE THAN EVER, ATARI HOME COMPUTERS ARE SPEAKING YOUR LANGUAGE.

With more program languages than ever to choose from, you now have more opportunities than ever to utilize the amazing capabilities of the ATARI 800™ Home Computer.

Whether you're a beginning programmer, or at the forefront of the art, you'll find an ATARI programming language that can make your task quicker and simpler than ever before. Just look at what ATARI has to offer:

ATARI Microsoft BASIC—Now we offer the industry standard, the most powerful Microsoft BASIC yet. With simple commands, it allows you to take advantage of unique ATARI hardware features such as our well-known player/missile graphics. For ease of programming, it includes n-dimensional arrays for numerics and string handling. And importantly, conversion procedures are simple.

ATARI Macro Assembler—Faster and more powerful than any ATARI language before, the ATARI Macro Assembler also allows you to access more memory space. And it's excellent for I/O interface and manipulation of such features as: player/missile graphics, sound registers and peripherals. In addition, the macro processor and "include" file library features speed-up program development considerably.

Fig-FORTH*—For specialized programming needs, such as educational or game applications, ATARI Fig-FORTH is uniquely effective. Fig-FORTH combines power and simplicity in an efficient 10K size, with characteristics of an interpreter and the speed of machine language code.

ATARI BASIC—An affordable and easy to use BASIC that requires only 8K of memory. It allows you to take advantage of the spectacular ATARI graphics and sound capabilities. And its immediate mode error messages greatly simplify debugging.

ATARI Assembler Editor—An excellent tool to assist the assembler-programmer in creating, editing and debugging assembly programs.

PILOT—ATARI PILOT is an exceptional learning language, with built-in "turtle" graphics to let you create spectacular designs and pictures with very short programs. Simple one or two-letter commands allow you to create a dialogue with the computer. And a single "match" command can perform complex text evaluation and pattern-matching instantly.

ATARI Pascal*—An excellent high-level language for teaching structured programming, and for developing and maintaining programs. In addition to offering all the features of the ISO Pascal standard, ATARI Pascal offers unique extensions that allow you to take advantage of ATARI graphics and sound capabilities.

ATARI is constantly developing new ways to help you get more out of your ATARI 800 Home Computer. So watch for more innovative and exciting programming languages from ATARI in the future.

For more information, write to ATARI, Inc.,
Dept. C3Z, P.O. Box 16525,
Denver, CO 80216.

ATARI®
A Warner Communications Company

© 1982 ATARI, Inc. All Rights Reserved
*Available from the ATARI Program Exchange

ATARI HOME COMPUTERS
We've Brought The Computer Age Home.™

CIRCLE 118 ON READER SERVICE CARD

the original sound source and the tape, even on the relatively low quality Realistic tape. A listener with better hearing than I commented that the Realistic tape did not have the highs of the original recording but there was no audible difference with TDK and Maxell tapes.

These days, most high quality recorders have two or three heads. Earlier Bang & Olufsen recorders did. However, in the interest of maintaining optimum head alignment, the 8000 and 9000 series recorders went back to a single head. The owners manual spends three pages in describing the rationale for this decision. The ultimate test, of course, is in listening and in this regard I judge that it is considerably better than my current Brand X recorder with three heads. If I want written proof, I can simply go to the computer alignment paper tape which came with the recorder showing that it has + 1 db response from 20 Hertz to about 15K Hertz.

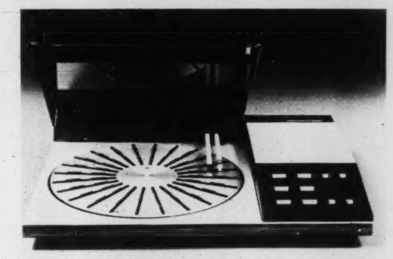
Rounding out the nifty features with the timer is the ability to set the time of day and a "Timer Start" and "Timer Stop" for making off the air recordings. These instructions are automatically communicated back to the Beomaster Receiver and the cassette deck is turned on and off automatically. If you wish to record, the receiver must already be on, however, if you wish to play back the deck will turn on the entire system. Thus, you could use it as a clock radio and wake up to a favorite tape.

I found that it took me some time to get used to the controls on the Beocord as they were quite different from a standard recorder. Initially, I was annoyed at not being able to monitor my recordings directly as I could with my existing deck. In some sense, I found the controls overly complicated for doing the "simplest" functions. On the other hand, once I got used to the "intelligence" of the deck coupled with the real time clock, I found it very much to my liking.

Beogram 8000 Turntable

Two innovations combine to make the Beogram 8000 one of the best, if not the best, turntable on the market today.

The first innovation is called "Tangengial Drive." A coil with a high number of windings is mounted outside of the circular aluminum plate which supports the turntable platter. When an electric current is passed through this coil, it produces a magnetic field. The stronger the current, the stronger the magnetic field. The aluminum plate next to this coil permits the magnetic field to pass through. However, the magnetic field within the aluminum plate does not decline correspondingly and an eddy current (also called a Foucault current) is induced.



Now if a similar coil with fewer windings is placed on the other side of the aluminum plate and a current is passed through, a weaker magnetic field is created. If the currents are kept in balance, a constant magnetic field will be maintained. Because the eddy current remains constant, the aluminum plate experiences a force that causes it to move. In this way, the turntable platter is caused to rotate with exceptional stability and reliability. In effect, driving the turntable is an electronic flywheel; there is no motor in the conventional sense. And because there is no conventional motor, there is no vibration, motor noise, motor hum, mechanical connections and resonances.

This system is coupled with a microcomputer programmed to continually compare two pieces of information: an unvarying frequency generated by a quartz crystal and the frequency created by the revolutions of the platter. The computer compares both signals and if there are deviations or phase differences it instantly sends instructions to the drive system and the speed is corrected. Because the revolutions of the platter itself serve as a reference for the correct speed, adjustment remains unaffected by changing line voltage and the turntable does not have to be adjusted with the exotic strobe lights or markings on a conventional system.

The second innovation is a lateral tone arm coupled with a cantilever cartridge. The extremely low mass, lateral tone arm is precisely perpendicular to the grooves in the record just as the original cutting head. Thus, tracking distortion is completely eliminated. However, in addition, the diamond stylus tip is mounted directly on the cantilever of the cartridge and not fitted with a bushing of any sort. This means the mass of the stylus assembly is held to a minimum which, in a practical sense, means low record wear. The cantilever of the cartridge is made of single crystal sapphire. Sapphire is an exceptionally rigid substance, some 500% stiffer than commonly used aluminum. Also, the speed of sound in the single crystal sapphire is twice that of aluminum which further reduces the possibility of phase distortion being introduced by the cantilever. Furthermore, the resonant frequency of single crystal sapphire is above the audible range so the entire assembly needs only minimal damping to achieve a flat frequency response.

Altogether, this leads to exceptionally flat response. Indeed, the computer data furnished with the cartridge indicates absolutely flat response from 20 Hertz to 18,000 Hertz on both channels.

Summing Up

In describing the Beosystem 8000, it is difficult to avoid the superlatives. Concert hall realism? Absolutely. Hum, hiss, and rumble? Virtually none. Off the air sensitivity and selectivity? Excellent. Visual appearance? Contemporary, refined and unobtrusive. Ease of use? Child's play on the receiver and turntable although it takes some getting used to for the cassette deck. Price? If you have to ask . . . (No, that's not fair, the receiver costs $2600, cassette deck $1800, and turntable $895.)

For that money, the minor glitches shouldn't be there. In particular, I would like to see provision for at least two more input sources in the receiver. I would also like to see U.S. standard connectors throughout (after all, the controls and displays are in English). And frankly, I would have expected a little more from the computer controlling the whole system. As it is, the computers handle the internal functions having to do with sound reproduction superbly. However, why shouldn't the control computer in the cassette deck be able to turn on the receiver to a particular station at a certain hour. Much more complicated control capabilities are built in to even the lowest cost video tape recorders (recording eight programs over fourteen days, etc). Even a $49.95 BSR timer unit controls up to 12 devices, each with their own on/off cycle. I would expect that level of control from an $1800 tape deck.

Nevertheless, for music reproduction the Bang & Olufsen Beosystem 8000 is superb. If you are yearning for a system with technical sophistication, outstanding design and the highest quality, and price is no object, this may well be the system for you. ☐

Digital Duo

David Ahl

creative computing
SOFTWARE PROFILE

Name: Electric Duet
Type: Music synthesizer
Author: Paul Lutus
System: 32K Apple, Disk Drive
Format: Disk
Language: Machine Language
Summary: Two-voiced music synthesizer all in software
Price: $29.95
Manufacturer:
InSoft
175 Barbur Blvd., Suite 202B
Portland, OR 97219
503-244-4181

Electric Duet is a music synthesizer software package for the Apple that plays two-part music without an add-on circuit board. While it can use the built-in Apple speaker, far better sound quality can be obtained either by using an external speaker in place of the internal Apple speaker or by using an external amplifier and speaker. To do this, the Apple cassette tape output jack (mini-phone plug) must be connected to the input of an amplifier. Since the output is monaural, you must use either the monaural switch on your stereo amplifier or, if it does not have one, a "Y" connector cable so that the monaural output may be fed into both stereo channels.

The normal range of *Electric Duet* is five octaves; however, notes in the upper half of the fifth octave are not accurate, hence, the usable range is 4-1/2 octaves. In playing back, it is possible to use a voice transpose to get a low sixth octave for one of the two voices. Incidentally, the internal Apple speaker will not play these notes because they are too low.

Paul Lutus, author of the *Electric Duet* system, created an all-software music synthesizer in the following way: First, a high-frequency carrier frequency (14080 Hz) is created. Then, the percentage of time it is turned on is based on whether one or the other of the two musical note cycles is "on" at the moment. Paul calls this "duty cycle modulation," which effectively transmits voltage increments to the speaker or the amplifier. These increments are controlled by counters containing numbers between 8 and 256. For example, to get middle A (440 Hz) the carrier frequency of 14080 is divided by the pitch number for middle A of 32 giving 440. You can see from this brief description why high frequency notes begin to lose accuracy.

As a result of producing notes in this way, the tonal quality doesn't begin to compare to a hardware system such as the ALF or Mountain Computer boards. Furthermore, these boards produce between three and nine voices usually in stereo. On the other hand, the cost of *Electric Duet* is a fraction of the cost of a hardware system and the resulting sounds are excellent, particularly considering they are produced entirely by software.

Note Entry

Note entry with *Electric Duet* may be done in one of three ways. Perhaps the easiest is music entry with a simulated piano. Upon selecting this option, a combination display will appear, part text editor and part stylized piano. The piano at the top of the screen covers a range of three octaves. The starting octave may be selected in order to extend the range to five octaves. Each key has a letter or number on it and, to play a note, that letter or number is simply pressed. This note then automatically appears in column 1 (for voice 1). You may then move to column 2 (voice 2) and play the second note or you may move down the score playing the melody line and come back later to put in the accompaniment.

The manual tells us, "the normal way to use the piano for music entry is to select the part with the most or shortest-duration notes, play that, then switch to

FREE CATALOG OF COMPUTERS AND SOFTWARE

- Easy-to-build Heathkit® Computers for hobbyists
- Typewriter-quality printers, smart video terminals
- Reliable service, friendly advice
- Fully assembled Zenith Data Systems Computers for business
- Heath User's Group library of 500 programs for home, work or play
- Wordprocessing – accounting – Super-Calc™ – small business applications
- Self-study courses for writing your own programs

HEATH/ZENITH

Your strong partner

☐ Yes, send me my free Heathkit Catalog. I am not currently receiving one.

name______________________________

address__________________________

city_______________________________

state______________ **zip**____________

Creative Computing 355-969 PC-143

FREE
HEATHKIT CATALOG

PLACE
STAMP HERE
Post Office
will not
deliver mail
without postage

HEATH COMPANY
Benton Harbor, MI 49022

THE $595* SMART TERMINAL

The Heath 19 Smart Video Terminal gives you all the important professional features you want in a terminal, all for under $600.* You get the flexibility you need for high-speed data entry, editing, inquiry and transaction processing. It's designed to be the backbone of your system with heavy-duty features that withstand the rigors of daily use.

Standard RS-232C interfacing makes the 19 compatible with DEC VT-52 and most computer systems. And with the 19, you get the friendly advice and expert service that makes Heath/Zenith a strong partner for you.

Sold through Heathkit Electronic Centers† nationwide (see your white pages for locations). Stop in today for a demonstration of the Heath 19 Smart Video Terminal. If you can't get to a store, send for the latest Heathkit® Catalog. Write Heath Co., Dept. 355-964 Benton Harbor, MI 49022.

HEATH/ZENITH

Your strong partner

Completely addressable blinking cursor lets you edit anywhere on screen.

Reverse video by character lets you emphasize words, phrases or paragraphs.

High resolution CRT gives you sharp, easy-to-read image, reduces eye-strain.

Z-80 microprocessor-control makes the 19 capable of multitude of high-speed functions. It's the only terminal with ROM source code readily available.

Complete ASCII character set including upper case, lower case with descenders, and special graphic symbols.

80 character by 24 line format, plus 25th line for operator messages and prompts.

Professional quality keyboard, standard typewriter layout, 72 keys, including 12 special function keys.

Insert and delete character or line plus erase to end of line and end of screen make the 19 ideal for sophisticated editors like WORD-STAR.

Cursor and special functions are accessible by keyboard or computer, using either DEC VT-52 or ANSI Standard protocols.

Keypad in calculator format permits fast, easy entry of numeric data.

*In kit form, F.O.B. Benton Harbor, MI. Also available the completely assembled Zenith Z-19 at $895. Prices and specifications are subject to change without notice.

†Heath Company and Veritechnology Electronics Corporation are wholly-owned subsidiaries of Zenith Radio Corporation. The Heathkit Electronic Centers are operated by Veritechnology Electronics Corporation.

CP-202C

THE GRAPHIC SOLUTION

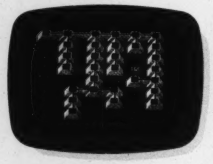
Solve your toughest communication problems with the Graphic Solution™, a sophisticated, new graphics package from Accent Software.

With precise, multi-speed ANIMATION create captivating sales presentations and product demonstrations that will both intrigue and inform your clients and customers. Watch their reactions; you'll see your messages getting through.

Develop educational materials and training aids that MIX TEXT AND GRAPHICS on the screen, breathing new life into abstract, hard-to-grasp concepts. Mix programs too. Images can be displayed on backgrounds loaded from any of your other programs. Construct custom TYPEFACES AND TYPESIZES to balance the visual elements.

INDUCTION
COMPRESS
POWER
EXHAUST
INTERNAL COMBUSTION ENGINE

Tired of run-of-the-mill business graphics? Change standard charts and graphs into colorful THREE DIMENSIONAL PERSPECTIVES. Add text and animate the data to show the relative rates of change for your most important information. Like cash flow projections. Or revenue estimates.



Plot flowcharts, time and motion studies, industrial process flows with COLOR-CODED ELEMENTS highlighting critical paths. Animate the sequences to show how flows actually progress.

Work with live action? Prepare film and videotape storyboards using the unique FRAME-BY-FRAME graphic sequencer that lets you create and animate a video story before shooting.

Whatever your graphic communication demands—in the business world, the arts, industry, education—The Graphic Solution™ at $149.95 has the answer. Take a hard look at The Graphic Solution. You'll like what you see.

Storytelling with

The Graphic Solution requires a 48K Apple II with ROM Applesoft and DOS 3.3.
See your local dealer or send $10.00 for a demonstration diskette to:

ACCENT SOFTWARE, INC.

3750 Wright Place, Palo Alto, Calif. 94306 Telephone 415-856-6505

Apple is a registered trademark of Apple Computer, Inc.

CIRCLE 103 ON READER SERVICE CARD

the other entry column and play the (relatively simple) accompaniment." For example, the following melody line represents the first eight notes of "Greensleeves":

R, 6, U, I, 0, I, U, T, E

If no note duration is specified, all notes will be automatically assigned a value of eight (eighth note) duration. Durations may be assigned either at the time of note entry or later on. A duration may be anything between 1 and 99, although normally only the values of 1 (whole note), 2 (half note), 4 (quarter note), 8 (eighth note), 16, 32, etc. would be used. Dotted notes, of course, would have duration values half way in between these.

Electric Duet has no provision to define measures. Rather, a part is entered as a continuous string of notes, thus requiring the user to keep accurate track of notes, rests, and the flow of a composition. Furthermore, corresponding notes in both parts must be of the same duration. In other words, it is not possible to hold a whole note in the accompaniment while four quarter notes play in the melody. Instead, the accompaniment must be four quarter notes.

Hence, you cannot simply copy sheet music into *Electric Duet*; it must be rewritten either on paper or in your head so that all notes in both parts are of the same duration. As a result of this rather severe limitation, *Electric Duet* is considerably more suitable for baroque and other types of music with fast-moving parts, than music with a melody line and a slow rhythm accompaniment.

A second method of entering music is to specify a note in the form:

2F
4A#
2G

reading respectively, an F in the second octave, an A sharp in the fourth octave, and a G in the second octave.

A third method of entering notes is simply to enter them as numbers. Remember that each note is created by a value divided into 14080. By entering these values, you may enter standard (or nonstandard) notes of whatever pitch you wish. Needless to say, you can create some rather spectacular special effects using this technique. You can also create some extremely unpleasant sounds reminiscent of Schönberg or a cat whose tail has just been stepped on.

When a song has been entered and you have it to your liking, it may be saved onto the disk. We recommend doing this before moving on to some of the other interesting, but potentially destructive commands of *Electric Duet*.

Other Commands

One such command is Transpose. With it, you can speed up or slow down all or part of a musical file, change the key in which it is played, and do special kinds of editing.

Each entry to Transpose includes a starting line number (note number), and ending line number, a specifier telling Transpose which part of the entry to change (voice one or two or the duration of both voices), and a number telling how far to move or change. For example, the entry T/0/8/D1/2/ will halve the duration of notes 0-8. The command T/9/17/N1/-4/ would lower the pitch four semi-tones of the notes 9-17 in Voice 1.

The price puts a music synthesizer within the reach of virtually anyone.

Editing your composition is accomplished by treating it as a file, opening it and inserting or deleting desired material, and closing it again. It is not a particularly handy feature and, being forced to use it once or twice, convinced me that taking a little extra time and care on initial note entry was well justified.

A note trace feature, which plays each note as it is scrolled from the editor (as the piano feature does) is provided. This helps in debugging a composition which, because of careless note entry, didn't come out quite right. We wish that provision were available for printing notes on a Silentype or other Apple printer. *Electric Duet* assumes we are living in an all electronic world and have no need for paper. So does every other music synthesis system, incidentally.

A wonderful feature of *Electric Duet* is the ability to load the playing routine in a basic program and call it from Basic. The playing routine is quite short, so it will not take up much space in your Basic program, yet the addition of music can enhance an otherwise ordinary Basic program enormously.

Although I've been spoiled by the marvelous entry, editing, sound, and visual playback features of the ALF Music System, I cannot help but be impressed with what Paul Lutus has accomplished with just the basic hardware of the Apple coupled with this amazing software package. On the negative side, I would have to downgrade *Electric Duet* for its inability to play notes of different duration simultaneously and for its awkward editing procedure. On the positive side, the price puts a music synthesizer within the reach of virtually anyone and it is the only system available that permits the easy addition of music in Basic and other programs. This alone is enough to recommend it.

On the disk that comes with *Electric Duet* are fourteen pre-programmed compositions, mostly by Bach. Using "Juke Box mode," these compositions can be played individually or the entire group sequentially. You can, of course, add your own compositions to this group or create your own Juke Box.

Electric Duet is rather effectively copy protected and, once booted cannot be exited except by turning off the computer. The disk provided is a two-sided disk with a backup copy of the program and music compositions on the second side. ☐

"We traded. Accounting got the 11/34, the 370 and the VAX. We got the soft drink machine."

Speech, Speech!

Gordon McComb

It wasn't long ago that hobbyists began giving their computers a say in matters. But voice synthesis has always been considered an expensive and time consuming proposition.

Times have changed.

Speech synthesis technology has come a long way since Radio Shack and others first offered their synthesizers to the public. These units, although advanced for their time, required programming sound by sound with an extensive and intricate word code. It took hours to input a few minutes of speech.

New models on the market, including Type 'n Talk by Votrax, Textalker/Echo from Street Electronics, and the Terminal Emulator II from Texas Instruments, enable the user to type in plain English for the synthesizer to duplicate. Text-to-speech voice synthesis has been around for a while, but only recently at prices that wouldn't leave you speechless.

Now every computer can, and should have a voice—it's simple, easy, and inexpensive. Let's take a look at how text-to-speech systems work and how you can use them with your computer.

Natural Synthetics

Simply stated, voice synthesis is the conversion of digital information to recognizable speech (in the majority of systems presently on the market). In actual operation, though, a synthesizer is much more complex.

We humans have vocal chords, a mouth, tongue, and lips to control the various sounds we make. A synthesizer must create them all electronically by the use of sound and noise generators, filters, timers, and delay circuits.

In a typical text-to-speech (TTS) system, the operator keys words in on his computer. These words are then sent to a text-to-speech translator or algorithm, which in this case, is a set of well defined prounciation rules.

The speech synthesizer then receives these modified signals, and through the use of various periodic and continuous sound generators, creates human sounding speech. After passing through a digital-to-analog converter, the synthesized signal is amplified and fed to a speaker.

In simpler terms: You type in h-e-l-l-o and you hear "hello."

In many TTS systems, the voice we hear over the speaker is a string of individual sounds called phonemes. There are several dozen different phonemes in the English language and they represent the sound created by uttering the letters in our alphabet during regular speech. Vowels have more than one phoneme each, since they can be long or short. Combinations of letters such as th and sh have their own unique phonemes.

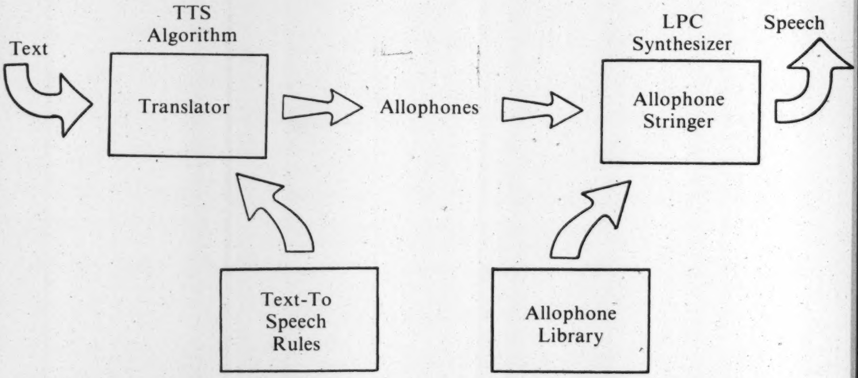
A few of the synthesizers on the market, particularly the Texas Instruments TMS5200 chip found in their Terminal Emulator II package, and the Echo from Street Electronics, create allophones, which are in effect "sons" of phonemes. There can be several allophones for each phoneme, such as the aspirated p in "pit," and the unaspirated p in "spit." A synthesizer based on allophone creation is usually more versatile than a phonemic synthesizer, although both can produce highly recognizable speech.

The ability to program a synthesizer sound by sound, instead of by prerecorded voice digitization, leads to the possibility of limitless vocabularies. English includes several of the sounds encountered in many foreign languages, so some of the synthesizers are capable of speaking German, Spanish, and French as well.

A Closer Look

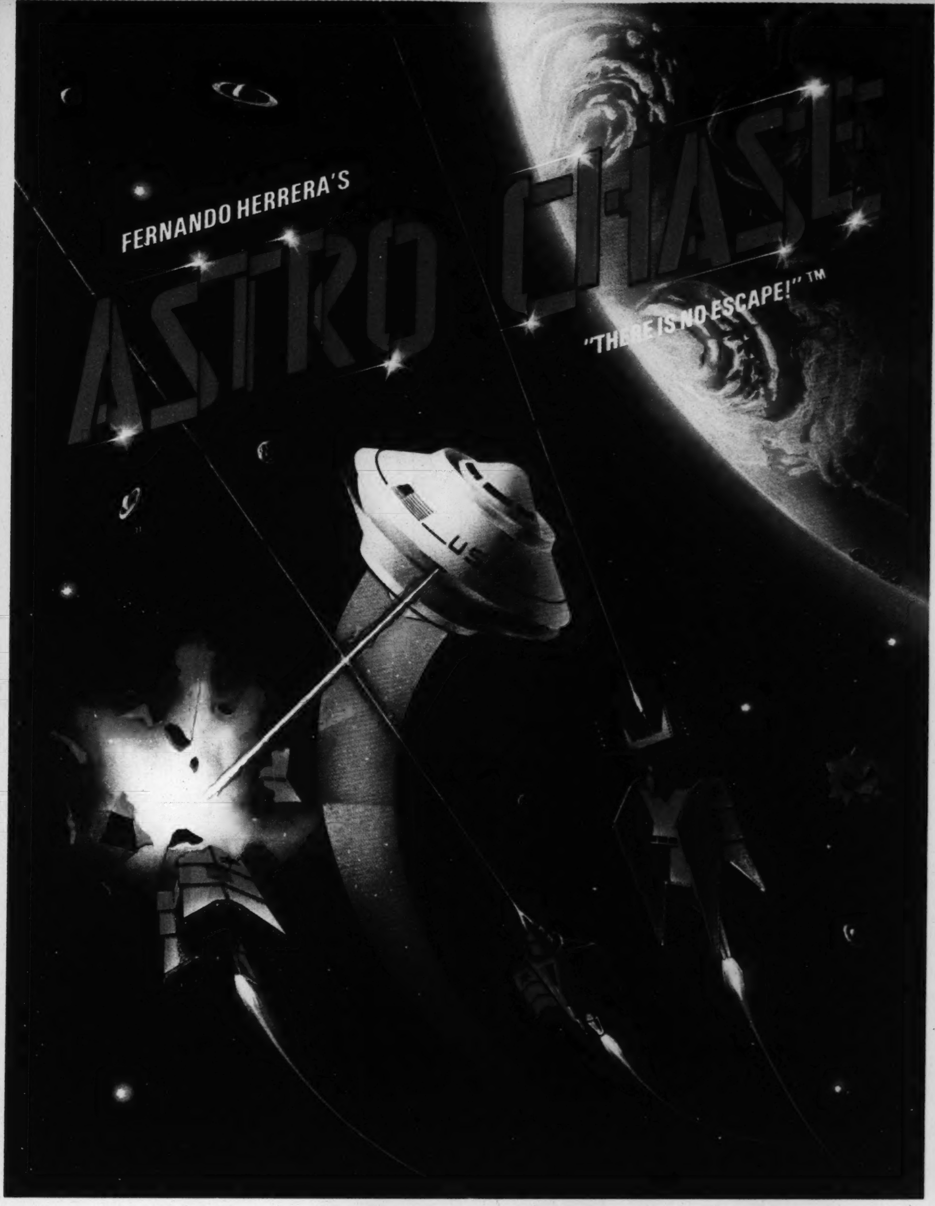
Most synthesizers employ two types of sound generators to produce speech: a voiced source and a fricative source. Voiced sounds include vowels and some consonants that have vowel sounds in them, such as v and z. Rs and ws are also produced by the voiced sound generator of most synthesizers.

The fricative generator is responsible for almost all of the consonants and can be characterized by a phoneme or allophone with a "noisy" rasp to it. Fricatives include s, k, f, sh, th, and so forth. For more details on sound



This is a block diagram of the Terminal Emulator II from Texas Instruments. As text is entered into the computer, the TTS algorithm module first translates the text into its allophonic equivalent and uses pre-programmed text-to-speech rules to compensate for pronunciation variances. The TTS module also includes rules for sentence contouring. The modified allophones are then converted to Linear Predictive Coding (LPC) strings. These strings are, in turn, processed through the TMS5200 speech synthesizer and spoken.

Gordon Mc Comb, 410 Escondido Avenue, Vista, CA 92083.



NEW

COSMIC SQUEEZE

COSMIC SQUEEZE ™
by Jason Pomerantz
graphics by Fernando Herrera

Fernando Herrera Strikes Again!

In *ASTRO CHASE*, his first program since winning the ATARI® STAR AWARD, Fernando delivers: Fast, Super, ARCADE GRAPHICS ★ 100% MACHINE LANGUAGE ★ SMOOTH SCROLLING UNIVERSE (different for each new game) ★ AWESOME SOUND EFFECTS ★ NON-STOP ACTION ★ MULTI-DIRECTIONAL FIRING ★ INTELLIGENT ENEMY ATTACK SHIPS ★ SINGLE THRUST PROPULSION™ ★ INVISIBLE FORCE FIELDS ★ MULTIPLE SKILL LEVELS ★ Many more INNOVATIVE and UNIQUE features.

FOR THE
ATARI®
HOME COMPUTER
32K

"THERE IS NO ESCAPE!"

Ask for FIRST STAR SOFTWARE at your local dealer.
Retail and Distribution inquiries invited.

DISK
AND
TAPE
$29.95*
(CARTRIDGE COMING SOON)

"When being first counts...we're number one"

To Order:
Call TOLL FREE 800-223-1545
nationwide except in New York
phone 212-889-1073

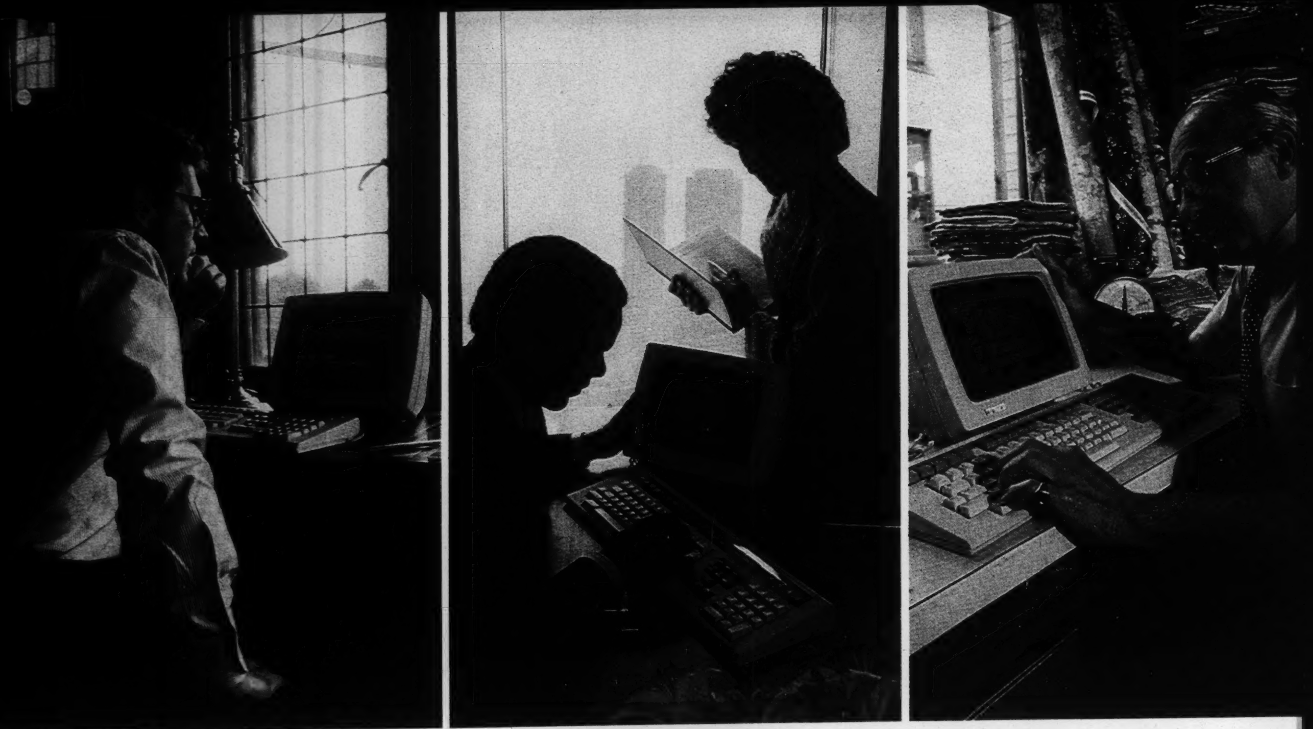
When using your MASTER CARD or VISA please have ready:
your card number & expiration date.
Send your check or money order - for $29.95* plus $2.00 shipping and handling to:
First Star Software, Inc.
22 East 41st Street
New York, NY 10017

When ordering, please specify DISK or TAPE
*New york residents please add 7% sales tax.

FIRST STAR SOFTWARE INC ™

CIRCLE 192 ON READER SERVICE CARD

ATARI® *is a registered trademark of Atari, Inc.*
Single Thrust Propulsion ™ is a registered trademark of First Star Software, Inc.
ASTRO CHASE, "there is no escape!"™ is a registered trademark of First Star Software, Inc.
COSMIC SQUEEZE™ is a registered trademark of First Star Software, Inc. ©, 1982 First Star Software, Inc.



THE THREE PERSONAL COMPUTERS EXPERTS SAY "BLOW EVERYTHING ELSE OUT OF THE MARKET."

Pro 300 series

The minicomputer of personal computers.

Once in a great while, personal computers come along that drive the normally staid computer press to extremes of praise. The personal computers made by Digital Equipment Corporation are such an example. These are the personal computers about which industry analysts such as The Yankee Group have said: "…comparing other currently available personal computers to (Digital's) Professional series is like comparing a sub-compact car to a Porsche."

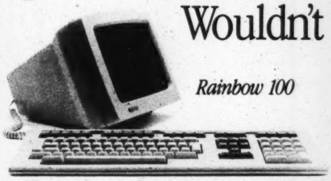
DECmate II

The fully supported small business system.

And further: "The trio of personal computers will blow everything else out of the market."

The Yankee Group was not alone. From the Rosen Electronics Letter: "Digital offers more storage, more memory, more expansion, more columns, and a higher performance central processor." And from The Gartner Group: "…the hardware specifications, design, and future upgrade planning appear superb."

What could inspire such remarks? Perhaps it was a feature like Digital's bit-map graphics—a graphics capability that makes yesterday's graphics look like yesterday's news. Or maybe it was the overall idea of a personal computer that could do more than one thing at a time. Or storage. Or memory. Or the idea of using two central processors instead of one.



Rainbow 100

The low cost high performance machine.

Wouldn't you like to find out a little more about Digital's personal computers? Call 800-DIGITAL and we'll send you our free brochure. Or write: Digital Equipment Corporation, 129 Parker Street, Maynard, MA 01754.

And if our words aren't good enough? Ask anybody else.

digital

MORE PERSONAL.
MORE COMPUTER.

Rainbow, DECmate and Professional are trademarks of Digital Equipment Corporation. © Digital Equipment Corporation 1982.

categories, refer to Table #2.

The signals from these two generators are then fed to a series of filters which is designed to mimic the human vocal tract. Texas Instruments uses a 12-stage network that includes 10 types of filters to alter the sound, as well as pitch and volume control. The pulses outputted by the filters are in digital form and must be fed to a digital-to-analog converter before they can be processed by an amplifier and heard as speech.

However, simply producing a string of vowels and consonants together without smoothing out the transitions will sound awkward and stilted. *Dynamic articulation,* or the transition between sounds, must be smooth, or the resultant speech will be nothing more than a series of choppy gibberish.

Voice synthesizers employ circuitry that slopes the beginning and ending of each phoneme or allophone. As an example, divide the word "computer" into its component sounds and you come up with something like: k-um-pu-t-er. Speak each of these phonetically without transitions and you have a word that is impossible to understand. Smooth out the transitions and you might come up with "kum-pew-ter." There. You can understand that.

While infants are learning to speak, they imitate not only sounds, but the inflections of voices as well. The rising and falling pitch of words and sentences aids in comprehension. Unfortunately, most hobby TTS synthesizers lack control in this area.

Serious programming and manufacturing advances have been developed to control the pitch of the voice and the playback to some extent. A few synthesizers for the personal computer market make it possible to control pitch under software control. It is also possible to pace the syllables and phrases better to create more life-like sounding speech.

Text Into Speech

So far, we have discussed how a synthesizer changes digital pulses into synthetic speech. But programming in binary or by using special codes can be painful and time consuming. With the aid of the proper software or firmware, it is possible to convert words written on a computer keyboard into the code necessary for the synthesizer.

What's more, you can alter certain words to conform to basic English language pronunciation. The algorithm guidelines that accomplish this are the basis for all text-to-speech voice synthesis. TTS algorithms convert complete words and sentences into correctly pronounced speech.

Algorithm programs, whether they be embedded in a memory chip inside the synthesizer (such as Type 'n Talk) or contained in software (such as the Echo/Textalker), look at each letter individually, then scan to either side to see how other letters in the word will affect pronunciation. The unit then searches a *rule table* so it can compare the scanned words with its stored definitions. When it sees a match, it corrects for proper pronunciation as indicated. If it doesn't see a match, it outputs the speech without any conversion.

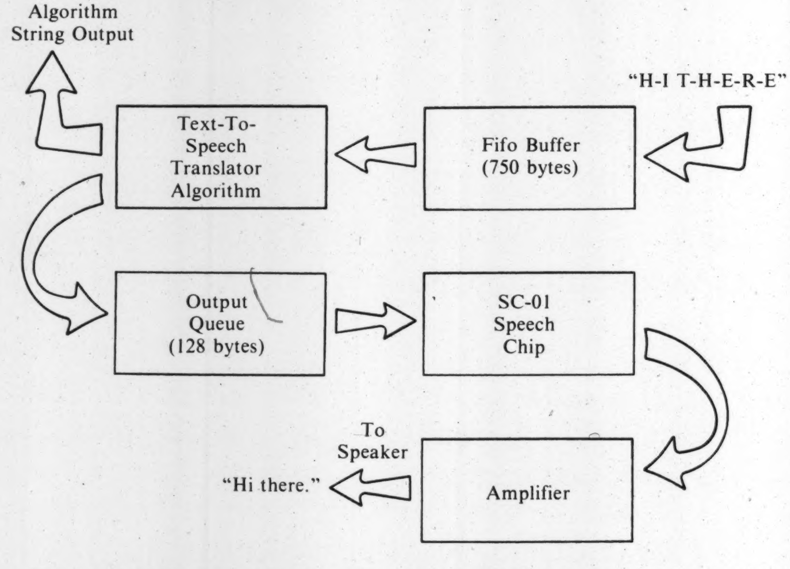
Programming With TTS

As you may have guessed, text-to-speech synthesizers will not produce every word they encounter perfectly. There are simply too many exceptions to the rules of English language pronunciation, and no program or device, no matter how complicated, can cope with them all.

Overall accuracy exceeding 90% is possible in some of the more complicated industrial TTS synthesizers; the personal computer units are somewhat less accurate, but are usually more than adequate for the job.

VOLUME
FREQUENCY
Votrax®
TYPE 'N TALK™
TEXT TO SPEECH SYNTHESIZER

The Votrax Type 'n Talk.



This is a block diagram of the Votrax Type 'n Talk. ASCII information is fed into the unit via an RS-232C output. Up to 750 bytes (about a minute of speech) can be temporarily stored in a first-in/first-out buffer. From there, the ASCII string is sent to the text-to-speech algorithm. The algorithm serves two purposes: it examines each word and corrects for pronunciation errors, and it converts the newly modified speech string into a form that can be readily inputted into the synthesizer. The 128-byte output queue is used as an extra storage block for translated data. The string is then sent into the SC-01 speech chip which creates a series of humming, clicking and other unique noise that combine to make human sounding speech. The chip has an on-board D-to-A converter so its output can be directly routed to the internal 1-watt amplifier.

apple discount software

CALSOFT

Personal—Entertainment—Business

SOFTWARE

Low Discount Prices / 15% to 25% Discount off List Price

Fast Convenient Service / We ship same or next day

Large Selection of Software / Call or Write for our FREE Catlog!

We have all the latest software—ASK US!

ATARI, IBM PC, CP/M: send for FREE catalog!

***Call Toll Free:** (800) 423-5290 **In California:** (213) 991-9641*

AVANT-GARDE

	Retail Price	*Our Price*
★ **Hi-Res Secrets**	**125.00**	**93.75**
Hi-Res Computer Golf	29.95	25.45
Zero Gravity Pinball	29.95	25.45
Word Scrambler/Super Speller	19.95	16.95

BRODERBUND

Apple Panic	29.95	25.45
David's Midnight Magic	34.95	29.70
★ **The Arcade Machine**	**59.95**	**44.95**
Track Attack	29.95	25.45
Star Blazer	31.95	27.15
Labyrinth	29.95	25.45
Choplifter	34.95	29.70
★ **Deadly Secrets**	**34.95**	**26.20**
Serpentine	34.95	29.70
Sea Fox	29.95	25.45
Hard Hat Noah	29.95	25.45

CONTINENTAL

★ **Home Accountant**	**74.95**	**56.20**
CPA Modules #1-4 (each)	250.00	212.50
★ **First Class Mail**	**74.95**	**56.20**

DATA MOST

Snack Attack	29.95	25.45
Thief	29.95	25.45
Swashbuckler	34.95	29.70
Casino	39.95	33.95
World Series Baseball	29.95	25.45
Missing Ring	29.95	25.45
Pig Pen	29.95	25.45

EDU-WARE

Empire I World Builders	32.95	28.00
Empire II Interstellar Sharks	32.95	28.00
★ **Rendezvous**	**39.95**	**29.95**
Prisoner 2	32.95	28.00
Algebra series (each)	39.95	33.95
Fractions/Decimals (each)	49.00	41.65
PSAT/SAT Word Skills (each)	49.00	41.65

HAYDEN

Sargon II	34.95	29.70
★ **Pie Writer**	**149.95**	**112.45**

INFOCOM

★ **Zork I**	**39.95**	**29.95**
Zork II	39.95	33.95
Zork III	39.95	33.95
Deadline	49.95	42.45

MICROSOFT

Adventure	29.95	25.45
Typing Tutor II	24.95	21.20
Olympic Decathlon	29.95	25.45
★ **TASC Compiler**	**175.00**	**131.25**

MUSE

Super Text 40/80	175.00	148.75
★ **Super Text 40/56/70**	**125.00**	**93.75**
Castle Wolfenstein	29.95	25.45

ON-LINE SYSTEMS

	Retail Price	*Our Price*
HI-RES Adventures 0-5		15% OFF
★ **Cross-Fire**	**29.95**	**22.45**
LISA	79.95	67.95
★ **LISA Educational System**	**119.95**	**89.95**
★ **General Manager**	**219.95**	**164.95**
Threshold	39.95	33.95
Screen Writer	129.95	110.45
★ **Screen Writer Professional**	**199.95**	**149.95**
Mouskattack	34.95	29.70
★ **Marauder**	**34.95**	**26.20**
Ultima II	59.95	50.95
EPF IV	79.95	67.95
Frogger	34.95	29.70
Cannonball Blitz	34.95	29.70
★ **The Artist**	**79.95**	**59.95**
Laf-Pak	34.95	29.70
Pest Patrol	29.95	25.45
Lunar Leepers	29.95	25.45

PEACHTREE

★ **Accounts Payable**	**400.00**	**320.00**
★ **Accounts Receivable**	**400.00**	**320.00**
★ **General Ledger**	**400.00**	**320.00**
Inventory Control	400.00	340.00
Payroll	400.00	340.00

PENGUIN

Complete Graphics System	69.95	59.45
★ **Graphics Magician**	**59.95**	**44.95**
Special Effects	39.95	33.95

SENSIBLE

Super Disk Copy III	30.00	25.50
Multi-Disk Catalog	25.00	21.25
★ **Sensible Speller**	**125.00**	**93.75**

SIR-TECH

Wizardry	49.95	42.45
Knight of Diamonds	34.95	29.70
Star Maze	34.95	29.70

SOFTWARE PUBLISHING

★ **PFS**	**125.00**	**93.75**
PFS: Report	95.00	80.75
PFS: Graph	125.00	106.25

STONEWARE

★ **DB MASTER**	**229.00**	**171.75**
DB Master Utility Pak #1	99.00	84.15
★ **DB Master Utility Pak #2**	**99.00**	**74.25**
Graphics Processing System	59.95	50.95

SYSTEMS PLUS

General Ledger	395.00	335.75
Accounts Payable	395.00	335.75
Accounts Receivable	395.00	335.75

TG PRODUCTS

Game Paddles	39.95	33.95
★ **Joystick**	**59.95**	**44.95**
Select-a-Port	59.95	50.95

SIRIUS SOFTWARE

	Retail Price	*Our Price*
★ **Gorgon**	**39.95**	**29.95**
Sneakers	29.95	25.45
Beer Run	29.95	25.45
The Joyport	49.95	42.45
Snake Byte	29.95	25.45
★ **Kabul Spy**	**34.95**	**26.20**
Minotaur	34.95	29.70
Bandits	34.95	29.70
Escape from Rungistan	29.95	25.45
Cyclod	29.95	25.45
Fly Wars	29.95	25.45
Free Fall	29.95	25.45
★ **Way Out**	**39.95**	**29.95**
Blade of Blackpool	39.95	33.95
Type Attack	39.95	33.95

STRATEGIC SIMULATIONS

Cartels & Cutthroats	39.95	33.95
Computer Quarterback (2nd Ed.)	39.95	33.95
The Shattered Alliance	59.95	50.95
★ **Southern Command**	**59.95**	**44.95**
Napoleon's Campaigns	59.95	50.95
Battle of Shiloh	39.95	33.95
Tigers in the Snow	39.95	33.95
Road to Gettysburg	59.95	50.95
Pursuit of the Graf Spee	59.95	50.95
★ **Guadalcanal Campaign**	**59.95**	**44.95**
Cytron Masters	39.95	33.95
Galactic Gladiators	39.95	33.95
SEUIS	39.95	33.95
The Cosmic Balance	39.95	33.95

VISICORP

★ **Visicalc**	**250.00**	**193.75**
Visitrend/Visiplot	300.00	255.00
Visidex	250.00	212.50
Visiterm	100.00	85.00
★ **Visifile**	**250.00**	**193.75**
Visischedule	300.00	255.00

We also carry complete lines from the following companies:

ADVENTURE INTERNATIONAL
ARTSCI • ASHTON-TATE
AUTOMATED • BEAGLE
BUDGECO • CAL PACIFIC
CAVALIER • GEBELLI
HOWARD • INNOVATIVE
KENSINGTON • MICROLAB
MICROPRO • PHOENIX
PICCADILLY • QUALITY
SENTIENT • SORCIM
SOUTHWESTERN • SUBLOGIC
SYNERGISTIC • VIDEX

If you don't see it, Ask Us!

CALSOFT

346 N. Kanan Rd. #103
Agoura, CA 91301

***Call Toll Free:** (800) 423-5290 **In California:** (213) 991-9641*

We accept Mastercard & Visa (include # and Expiration Date), check, COD ($1.50 extra), or Money Order. California residents add 6% sales tax. Include $2.00 for shipping (UPS Blue Label $3.00, Canada $6.00, other foreign countries $10.00).

★ Sale prices are through December only! Prices subject to change without notice.

CIRCLE 132 ON READER SERVICE CARD

Table 1. Phoneme Chart.

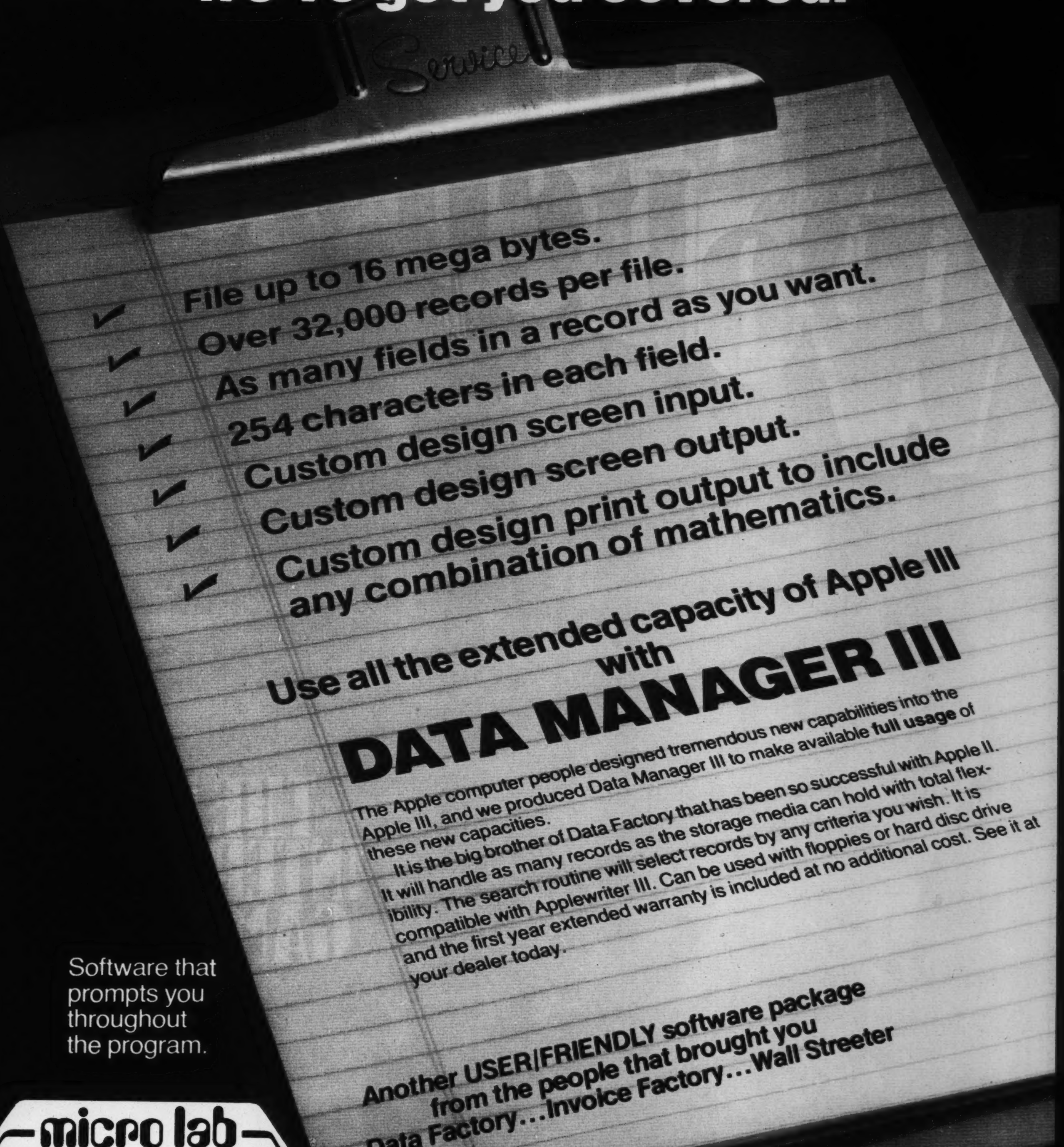
Phoneme Code	Phoneme Symbol	Duration (ms)	Example Word
00	EH3	59	jacket
01	EH2	71	enlist
02	EH1	121	heavy
03	PA0	47	no sound
04	DT	47	butter
05	A2	71	made
06	A1	103	made
07	ZH	90	azure
08	AH2	71	honest
09	I3	55	inhibit
0A	I2	80	inhibit
0B	I1	121	inhibit
0C	M	103	mat
0D	N	80	sun
0E	B	71	bag
0F	V	71	van
10	CH*	71	chip
11	SH	121	shop
12	Z	71	zoo
13	AW1	146	lawful
14	NG	121	thing
15	AH1	146	father
16	OO1	103	looking
17	OO	185	book
18	L	103	land
19	K	80	trick
1A	J*	47	judge
1B	H	71	hello
1C	G	71	get
1D	F	103	fast
1E	D	55	paid
1F	S	90	pass
20	A	185	day
21	AY	65	day
22	Y1	80	yard
23	UH3	47	mission
24	AH	250	mop
25	P	103	past
26	O	185	cold
27	I	185	pin
28	U	185	move
29	Y	103	any
2A	T	71	tap
2B	R	90	red
2C	E	185	meet
2D	W	80	win
2E	AE	185	dad
2F	AE1	103	after
30	AW2	90	salty
31	UH2	71	about
32	UH1	103	uncle
33	UH	185	cup
34	O2	80	for
35	O1	121	aboard
36	IU	59	you
37	U1	90	you
38	THV	80	the
39	TH	71	thin
3A	ER	146	bird
3B	EH	185	get
3C	E1	121	be
3D	AW	250	call
3E	PA1	185	no sound
3F	STOP	47	no sound

/T/ must precede /CH/ to produce CH sound.
/D/ must precede /J/ to produce J sound.

Table 2. Categories According to Production Features.

Voiced					'Voiced' Fricat.	'Voiced' Stop	Fricative Stop	Fricative	Nasal	No Sound
E	EH	AE	UH	OO1	Z	B	T	S	M	PA0
E1	EH1	AE1	UH1	R	ZH	D	DT	SH	N	PA1
Y	EH2	AH	UH2	ER	J	G	K	CH	NG	STOP
Y1	EH3	AH1	UH3	L	V		P	TH		
I	A	AH2	O	IU	THV			F		
I1	A1	AW	O1	U				H		
I2	A2	AW1	O2	U1						
I3	AY	AW2	OO	W						

Copyright Votrax® 1980



O.K. APPLE III
we've got you covered.

Service

- ✓ File up to 16 mega bytes.
- ✓ Over 32,000 records per file.
- ✓ As many fields in a record as you want.
- ✓ 254 characters in each field.
- ✓ Custom design screen input.
- ✓ Custom design screen output.
- ✓ Custom design print output to include any combination of mathematics.

Use all the extended capacity of Apple III with

DATA MANAGER III

The Apple computer people designed tremendous new capabilities into the Apple III, and we produced Data Manager III to make available **full usage** of these new capacities.

It is the big brother of Data Factory that has been so successful with Apple II. It will handle as many records as the storage media can hold with total flexibility. The search routine will select records by any criteria you wish. It is compatible with Applewriter III. Can be used with floppies or hard disc drive and the first year extended warranty is included at no additional cost. See it at your dealer today.

Another USER/FRIENDLY software package from the people that brought you Data Factory...Invoice Factory...Wall Streeter

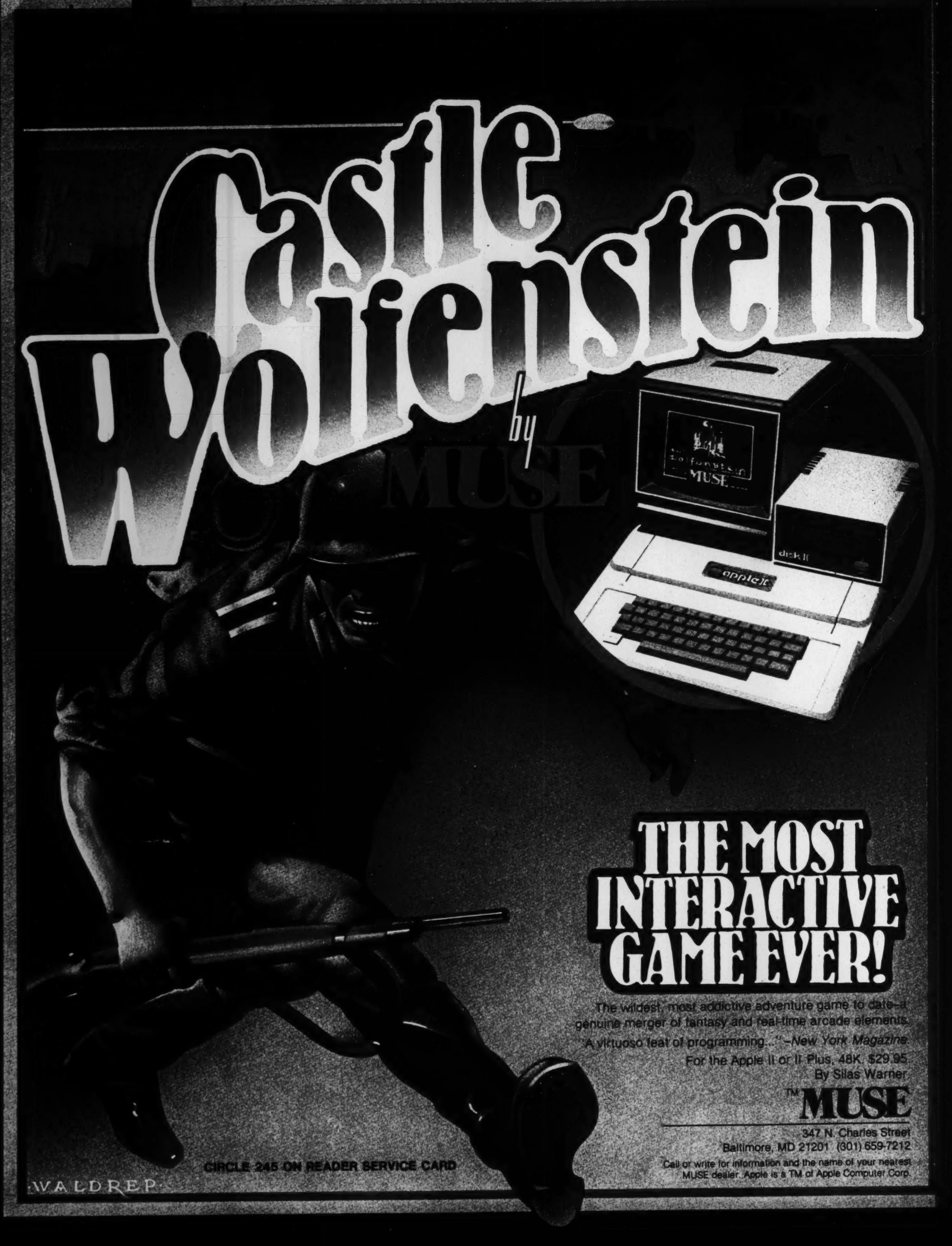
Software that prompts you throughout the program.

micro lab
systems that work

312-433-7550

2310 Skokie Valley Road Highland Park, Illinois 60035

CIRCLE 233 ON READER SERVICE CARD


Castle Wolfenstein
by MUSE
THE MOST INTERACTIVE GAME EVER!
WALDREP
Wolfenstein
MUSE
apple][
disk][

"The wildest, most addictive adventure game to date–a genuine merger of fantasy and real-time arcade elements. A virtuoso feat of programming..." –*New York Magazine*.

For the Apple II or II Plus, 48K. $29.95.
By Silas Warner.

™MUSE

347 N. Charles Street
Baltimore, MD 21201 (301) 659-7212

Call or write for information and the name of your nearest MUSE dealer. Apple is a TM of Apple Computer Corp.

CIRCLE 245 ON READER SERVICE CARD

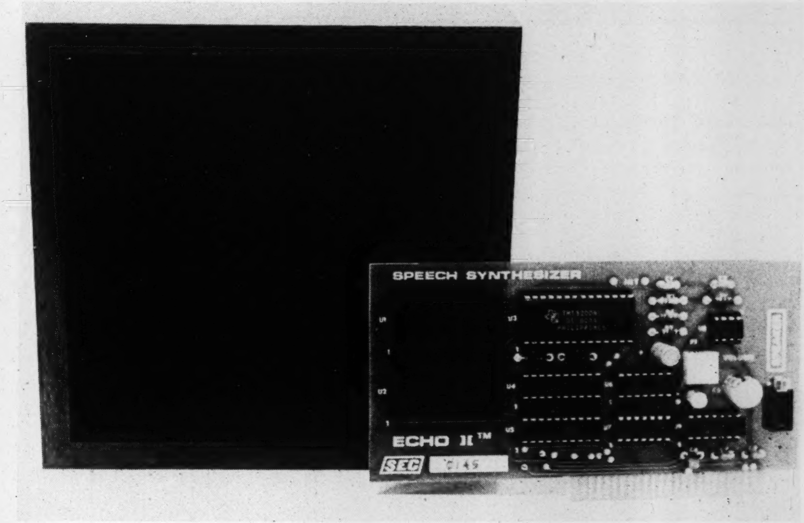
When working with a good TTS system, you can "bend the rules" to make words sound better. This can be done in a variety of ways. The most basic is to misspell the word. "Clothes" will sound a bit odd on a voice synthesizer so you might mispell it "cloze."

Words can also be split to help in pronunciation and timing. "Computer" usually sounds strange so you might change it to "com puter." Likewise, the text-to-speech translator would have a heck of a time pronouncing a word like "baseball," since it wouldn't recognize the long a and silent e. ("Baseball" doesn't follow the standard rules, mainly because it is a compound word.) Breaking it up into "base ball" easily corrects this fault.

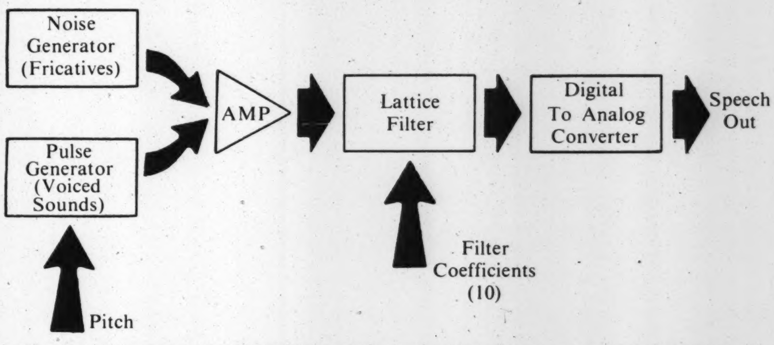
The third way of dealing with an exceptionally difficult word is to bypass the TTS algorithm and access the speech synthesizer directly. This can usually be done under software control and greatly aids in better programming. If a particular sound isn't quite right, you can easily substitute for it by using the proper codes.

In Use

There are many ways to use voice synthesis with your computer. Text-



The Echo II speech synthesizer.


Noise Generator (Fricatives)
Pulse Generator (Voiced Sounds)
Pitch
AMP
Lattice Filter
Filter Coefficients (10)
Digital To Analog Converter
Speech Out

The Texas Instruments TMS5200 speech synthesizer chip uses two sound generators. One produces fricatives (f, s, k, sh, etc.); the other voiced sounds (e, i, a, o, etc.). An amplifier boosts these signals which are in digital form, then sends them to a lattice filter network. The filters are based on a mathematical reconstruction of the human vocal tract. After the incoming data has been modified by the filters, it is converted to analog signals, then amplified. The speech that results is of very high quality and easy to understand. The TMS5200 can be controlled by prestored ROM data (like that found in Speak 'n Spell) or information inputted by a CPU.

UNIQUE
Microcomputer Software In Science
For The Middle/Junior High School
- Life Science
- Physical Science
- Earth Science
- Health

AVAILABLE FOR:
APPLE II
TRS-80
PET

Bring your curriculum into the computer age with our new microFOCUSware.
- Reinforces what teachers teach
- Educational-interactive game formats
- Makes learning fun
- Comes with extensive Teacher's Lesson Planner
- No knowledge of programming needed.

TITLES:
YOUR BODY (2 series) - 4 programs each ($119/series)
MATTER & ENERGY - 6 programs ($159)
CHEMISTRY (Series I) - 3 programs ($89)
ENERGY - 2 programs ($69)
IDENTIFYING MINERALS - 1 program ($39)
WATER & WEATHER - 3 programs ($89)

PREVIEW PROGRAM AVAILABLE
$10 CHECK OR PO
Or Send for Complete Brochure:
FOCUS
FOCUS MEDIA, INC.
Drawer #15
135 Nassau Blvd.
Garden City, NY 11530

CIRCLE 360 ON READER SERVICE CARD

to-speech clears the way. A good introduction to TTS voice synthesis would be to use it in connection with a simulation or adventure game. Load up *The Count,* or other game and you and your synthesizer can explore dungeons, escape evil vampires, and together, glory in all your plundered loot.

Another use might be as a prompt for education and computer aided instruction programs. With a voice synthesizer, the screen is free to display graphics and other detailed data.

Voice synthesis, in conjunction with text-to-speech, can be a great help to the verbally and visually handicapped. Both outgoing and incoming messages can be transmitted easily and with surprising intelligiblity.

Since voice output from a computer frees you from continually looking at the screen, business programs can be enhanced and simplified. A bookkeeper can input names and account balances and *hear* confirmations and totals.

Voice synthesis can make your personal programs more lively and entertaining. The personalized flavor helps attract and hold attention.

Other uses include connecting the synthesizer to a telephone amplifier and auto-answer modem. Program the computer to answer the phone while you are away and have it playback a synthesized message. An elaborate set up might enable your computer to answer specific questions—questions asked by the caller by pushing a button on a Touch-Tone telephone.

> ***Voice synthesis should be an integral part of your system, but not the center of it.***

To be used most effectively, voice synthesis should be an integral part of your system, but not the center of it. Take care not to go overboard. Use voice synthesis when it will get the message across best. Overuse it, and it might become a tired fad.

You will probably find it a little difficult to understand everything a voice synthesizer says during your first couple minutes of speech. You especially need a break-in period with a TTS synthesizer since you must accustom yourself to the sometimes strange pronunciation of certain words. But like any dialect, you can quickly catch on to its idiosyncrasies and learn to understand perfect "synthesizer-eze."

Voice synthesis is being used in toys and games, microwave ovens, and cars—so why not wait with your home computer. You will find the new dimension of speech a welcome addition to your system—one that is cost effective and useful as well.

And with the added advantage of easy to program text-to-speech encoding, work that used to take hours can be accomplished in just minutes. So give your computer a voice. ☐

Firms Mentioned In This Article:

Street Electronics Corp.
1140 Mark Ave.
Carpinteria, CA 93013

Texas Instruments Incorporated
Consumer Relations
P.O. Box 53
Lubbock, TX 79408

Vodex (for Votrax products)
500 Stephenson Hwy.
Troy, MI 48084

Choose from the MOST COMPLETE LINE of VIC® software

CITY BOMBER / MINEFIELD
2 games: CITY BOMBER, the most addicting arcade-style game you've seen on a VIC! You have to bomb every building! MINEFIELD is a game of intense concentration, requiring keen logical thinking.
$23.95 cassette

BLACK HOLE
An exciting, difficult, original space game! The swirling Black Hole is constantly trying to draw you in; you also have dangerous space debris to avoid or destroy—if you miss, they are transformed into malicious space baddies out to get you! Great graphics and sound!
$34.95 cartridge only

EDUCATIONAL/RECREATIONAL I
2 programs: HANGMAN—try to guess the letters of a word. Every time you guess wrong, a cartoon character takes one step closer to being hanged! HANGMATH—try to guess the digits of a multiplication problem; a game of logic and deduction! Both with color and animated graphics.
$14.95 cassette

LOAN ANALYZER
Has Amortization tables, computes interest charges, compares various loans, analyzes loan terms, and can manipulate loan parameters!
$14.95 cassette / $19.95 disk

LOGIC GAMES PACKAGE
2 programs: CODE MAKER and CODE BREAKER based on the famous Mastermind game by Invicta. Has color, graphics, and sound!
$14.95 cassette

EDUCATIONAL/RECREATIONAL II
2 programs: MATH HURDLER—you are racing on a track where the hurdles are arithmetic problems! MONSTER MAZE—exploring a labyrinthian cave populated with monsters; makes a new maze every time!
$14.95 cassette

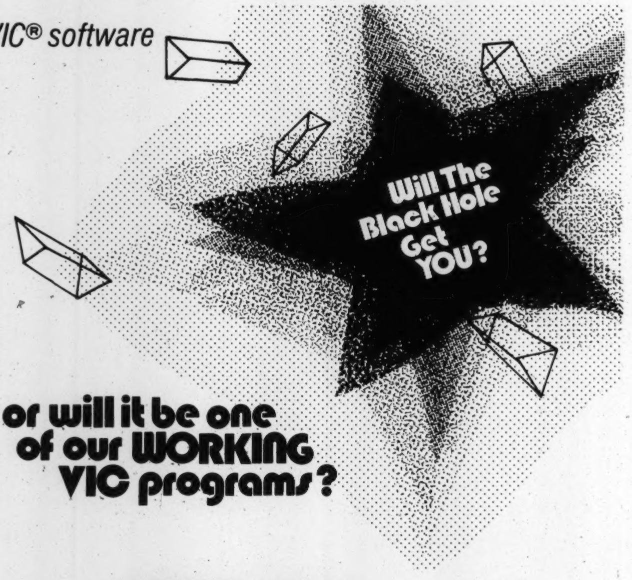
DECISION MAKER
Can help you decide between alternatives and it computes recommended choices. Will also manipulate decision parameters, weigh influencing factors and save decisions on tape or disk.
$19.95 cassette / $24.95 disk

CAR COSTS
Record maintenance costs, itemize insurance payments, track fuel consumption, summarize all costs to date as well as compute the cost of an individual trip.
$19.95 cassette / $24.95 disk

ACTION GAMES
3 games on 1 cassette: SEAWOLF, a submarine game with different levels of skills, sound, color, and challenge! BOUNCEOUT, a game of anticipation and reflexes—variable skill levels. VIC TRAP—you play against the VIC, trying to trap VIC, who automatically keeps a running score.
$24.95 cassette

HOME INVENTORY
Use it to catalog your possessions—it has user-definable categories. Record serial numbers, purchase prices, and other useful information, as well as computing the value of items.
$19.95 cassette / $24.95 disk

HOUSEHOLD FINANCE
16 income and expense categories plus budgeting, Monthly and Yearly accounting, keeps track of tax deductible items, produces graphs and tables.
$34.95 cassette / $39.95 disk


Will The Black Hole Get YOU?
or will it be one of our WORKING VIC programs?

CREATIVE SOFTWARE
A Division of ASCI, Inc.

201 San Antonio Circle
Mountain View, CA 94040
(415) 948-9595

TO ORDER: VISA/MasterCard, check or money order accepted. If a charge, please include expiration date of card. Add $1.50 for shipping and handling. California residents add sales tax. *Ask about our many other recreational and home applications!*

Explore the Frontiers of Intelligence

THE MIND OF MAN

Chess, **Checkers**, and **Odin** (as played by U.S. Othello Association rules) are classic games of the intellect. They evolved over the centuries as a way to understand complex situations and achieve mastery in action.

Now, by interacting with the intelligence embodied in these programs, you can participate in the exciting challenge of the **Mind of Man.**

FOR ALL GENERATIONS— A NEW GENERATION OF INTERACTIVE INTELLIGENCE

Chess, **Checkers**, and **Odin** are unique—in playing strength and in what they let **you** do. You can try out any idea—and even get ideas from the programs themselves. Plus, it is easy and fun to play the games and use their many features.

• Different levels of play, from beginner to expert • Advice on best move • Take back and replay moves • Auto and manual modes • Instant replay of games • "Change" feature adds or subtracts pieces • Sophisticated opening libraries • Clear graphics • Instructions include chapter on skillful play.

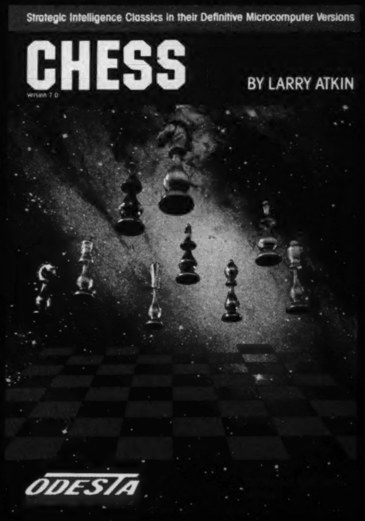
THE PEOPLE BEHIND THE PROGRAMS

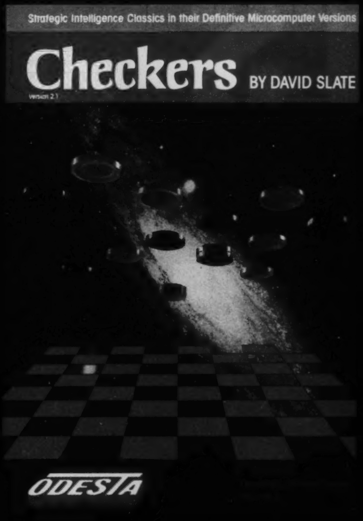
LARRY ATKIN AND DAVID SLATE

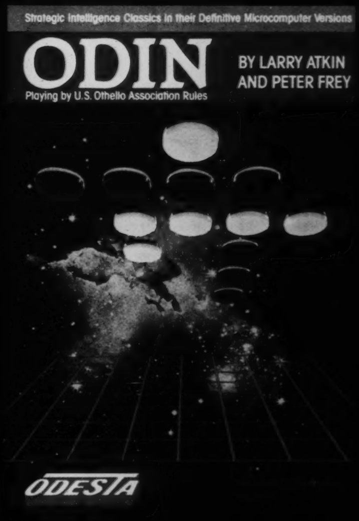
Authors of the Northwestern University 4.7 Computer Chess program. Winners of the World Computer Chess Tournament, 1977-1980. Winners of 8 North American Computer Chess Championships between 1970 and 1979. Two of the world's authorities on machine intelligence.

PETER FREY

Professor at Northwestern University, teaching courses in Psychology and Computer Science. Editor of and contributor to the definitive text on computer chess: **Chess Skill in Man and Machine.** One of the U.S. Othello Association's top-ranked players.


Strategic Intelligence Classics in their Definitive Microcomputer Versions
CHESS
Version 7.0
BY LARRY ATKIN
ODESTA


Strategic Intelligence Classics in their Definitive Microcomputer Versions
Checkers
Version 2.1
BY DAVID SLATE
ODESTA


Strategic Intelligence Classics in their Definitive Microcomputer Versions
ODIN
Playing by U.S. Othello Association Rules
BY LARRY ATKIN AND PETER FREY
ODESTA

CHALLENGES THE PROFICIENT; INSTRUCTS THE BEGINNER.

A new microcomputer standard for what many consider to be the ultimate game of the intellect. In addition to its superior playing strength, **Chess** from Odesta introduces a new generation of interactive intelligence—with 27 cursor-controlled features, including:

• Advice and prediction of best moves • Save games to disk • Graphic illustration of attacks and defenses • Variations of blind-fold chess • 17 levels of play, including postal and mate-finder modes • Enactment of over 30 classic human and computer chess games • Plus—an opening library of over 7000 moves.

For those who want the best.

YOU'VE NEVER KNOWN CHECKERS LIKE THIS!

Learn the complexities of this surprisingly sophisticated strategy game by interacting with **Checkers'** 24 user features.

• Play against 16 levels of difficulty • Watch **Checkers** play against itself—one level against another • Switch to "Give-away" mode, where the object is to make your opponent take **your** pieces • Watch the **Checkers** movie—an instant replay of a whole game • For those interested in the inner-workings of "programs that think", adjust 58 program parameters, so that **you** can experiment with the way **Checkers** itself thinks, and how it plays.

An ideal introduction to artificial intelligence.

WHY ARE 20 MILLION PEOPLE PLAYING THIS GAME?

A classic board game, where the object is to entrap your opponent's pieces—but only at the right time. The rules of play are simple and the game fast. At your disposal are the full range of features found in all of Odesta's **Mind of Man** series. You will need them, along with your keenest insight and deepest perception, to master the secret of **Odin** (playing by U.S. Othello Association rules). Join the growing number of strategists exploring the subtleties of a game that may change the way you think.

ODESTA

930 Pitner
Evanston, IL 60202
(U.S.A.)

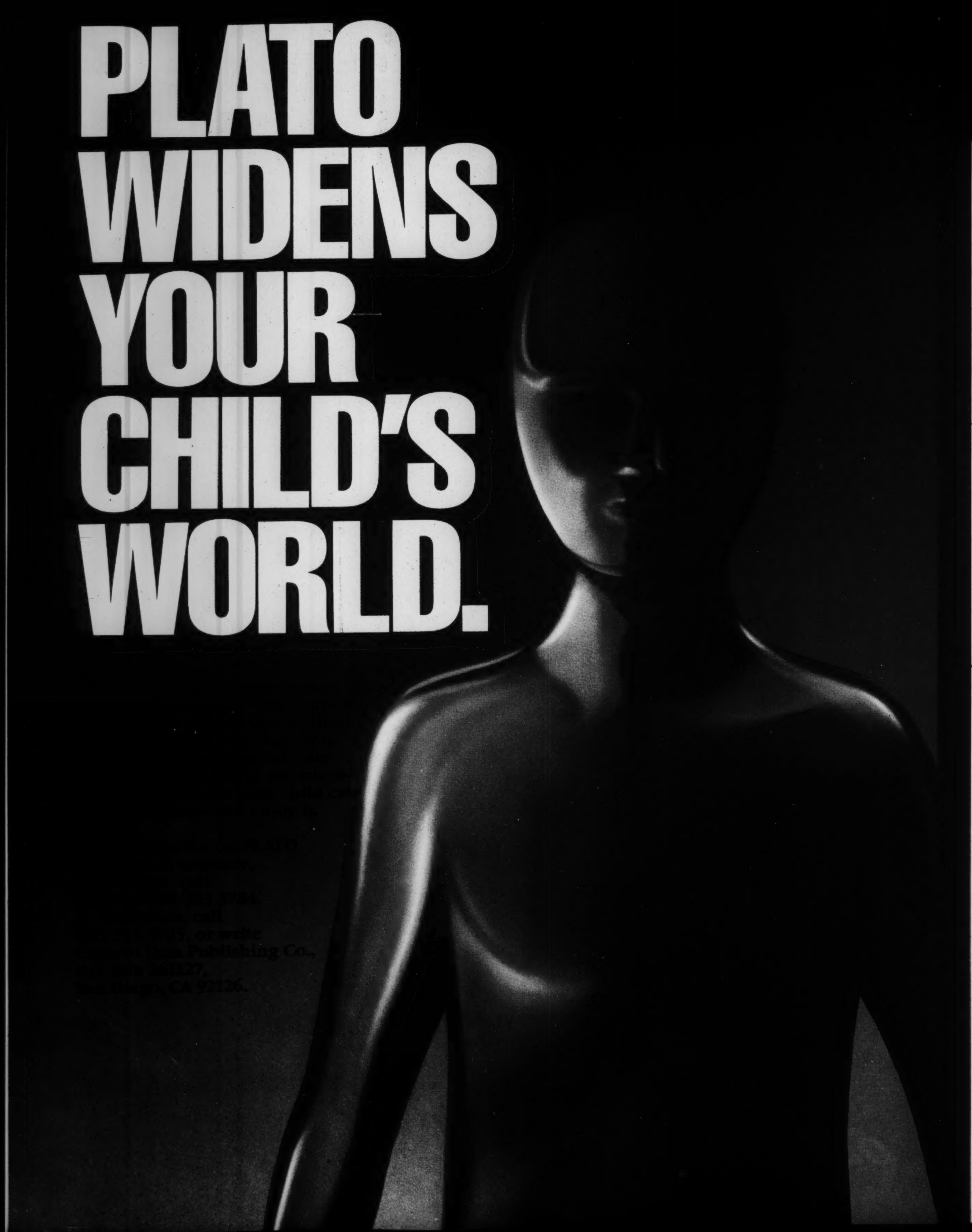
Chess: $69.95
Checkers: $49.95
Odin: $49.95

See your local software dealer, or order (Mastercard or Visa)
800-323-5423
(in Illinois, call 312-328-7101)

For **Apple II**, **Apple II Plus** 48K disk systems, and **Atari** 48K disk systems. Odin is also available for **TRS-80 Model 1 & 3** 32K disk systems.

CIRCLE 252 ON READER SERVICE CARD

© 1982 ODESTA


PLATO
WIDENS
YOUR
CHILD'S
WORLD.

[illegible] PLATO
[illegible]
[illegible]-5784.
[illegible] call
[illegible]5, or write
[illegible] Publishing Co.,
P.O. Box 261127,
San Diego, CA 92126.

WIDEN YOUR CHILD'S WORLD WITH THIS INTRODUCTORY OFFERING.

10 DAY MONEY BACK GUARANTEE.

Now, until May 31, 1983, when ordering a lesson at $45.00, you may order additional lessons for just $35.00 each. (Back-up disk is included with each lesson at no additional charge.)

Mail this form, or call toll-free 800/233-3784. (In California, call 800/233-3785.)

BEFORE ORDERING: CHECK TO MAKE SURE YOUR EQUIPMENT MEETS THESE REQUIREMENTS.

	Apple II PLUS	**Atari 800**	**TI 99/4A**
Memory:	48K	48K	32K Memory Expansion
No. of drives required:	1 disk and controller	1 disk and controller	1 disk and controller
Operating System:	D.O.S. 3.3	D.O.S. 2	PLATO Interpreter Cartridge*
Will display on any color or b/w monitor or TV compatible with your microcomputer listed above.			

*PLATO Interpreter Cartridge may be ordered directly with the order form below. Only one per TI 99/4A machine is needed.

CONTROL DATA PUBLISHING CO., P.O. Box 261127, San Diego, CA 92126

SHIP TO: (Please Print)

Name ____________________

Address ____________________

City ____________________ State __________ Zip __________

☐ Payment enclosed (Check or money order only. Make payable to Control Data Publishing Co.).

☐ Mastercharge ☐ VISA ☐ American Express ☐ Diners Club

Card Number |_|_|_|_|_|_|_|_|_|_|_|_|_|_|_|_| Expiration Date __________

Your signature ____________________

Telephone No. (   ) ____________________

Please complete the following:

Quantity	**Title**
	Basic Number Facts
	Whole Numbers
	Decimals
	Fractions
	Physics: Elementary Mechanics
	French Vocabulary Builder
	German Vocabulary Builder
	Spanish Vocabulary Builder
	Computer Literacy: Introduction

For use with: (check one)

☐ **Apple II Plus**
Available: Nov. '82

☐ **Atari 800**
Available: Dec. '82

☐ **TI 99/4A**
Available: Jan. '83

Allow 3-5 weeks for delivery.

INTRODUCTORY PRICES:

One lesson $45.00. Each additional lesson $35.00.

☐ Include PLATO Interpreter Cartridge for my TI 99/4A. Price $50.00.

Price for above order: . . . . . $__________

Calif. Residents: add 6% sales tax . . . . $__________

Add $2 shipping and handling . . . . $ 2.00

TOTAL PRICE: . . . . $__________

☐ Please send information on __________ __________ lesson(s).

If not completely satisfied, you may return all lesson material within 10 days of receipt for a refund. All orders subject to acceptance. Offering expires May 31, 1983.

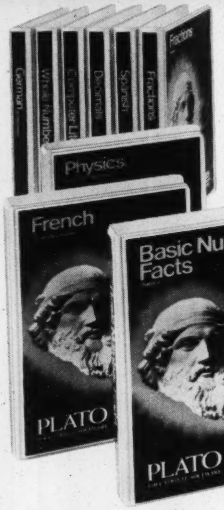
Control Data Publishing Company supplies this software under a personal license agreement rather than for sale. Customers obtain the right to possess and use PLATO software by paying the prices specified and agreeing to the terms and conditions of the license agreement contained in the package.

Apple® is a trademark of Apple Computer, Inc. Atari® is a registered trademark of Atari, Inc. TI® is a registered trademark of Texas Instruments, Inc.

Warranty available free from the Control Data Publishing Co., 4455 Eastgate Mall, San Diego, CA 92121.

CC-12

PLATO WIDENS YOUR CHILD'S WORLD.


German
Whole Numbe
Computer Li
Decimals
Spanish
Fractions
Fractions
Physics
French
Basic Number Facts
PLATO
PLATO

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 200108 SAN DIEGO, CA

Postage will be paid by addressee

CONTROL DATA PUBLISHING CO.
P.O. Box 261127
San Diego, CA 92126

NOW, QUALITY EDUCATIONAL SOFTWARE IS AVAILABLE FOR YOUR HOME COMPUTER.

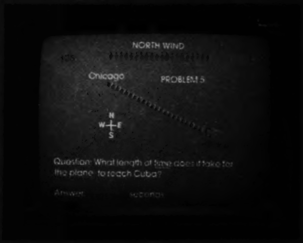
- PLATO® software now available on disks in Math, Physics, Foreign Languages, Computer Literacy—and more is on the way.
- For use on your Apple II Plus, TI 99/4A or Atari 800.
- Introductory Offering: Single lesson, $45.00; additional lessons, $35.00 each. 10-day money-back trial.

[illegible] LESSONS THAT FIT

[illegible]

[illegible] your child [illegible] practice basic numbers, including addition [illegible] carrying, subtraction without borrowing and multiplication/division with single digits. Kids race against time to build up their speed in these math areas. Designed for elementary school age, or any child who needs practice with basic whole number operations.

- **Whole Numbers:** simulates a pinball game to hold and build interest in whole number operations. Problems include addition, subtraction, multiplication, division and mixed numbers. Designed for elementary and junior high age groups.
- **Decimals:** kids are challenged to break balloons by entering the correct decimal corresponding to the position of the balloon on a vertical line. Numbers are entered on a trial-and-error basis. Software automatically adjusts difficulty to the child's performance. For elementary math students.
- **Fractions:** same format as Decimals, but requires the use of fractions to break the balloons. Numbers are entered on a trial-and-error basis. Balloons may burst in any order until none are left. Difficulty adjusts to your child's performance. For elementary math students.
- **Computer Literacy**—[illegible] simple, supportive graphics. It presents the history and uses of computers in today's society. Designed for junior or senior high and vocational school students.
- **French Vocabulary Builder.**
- **Spanish Vocabulary Builder.**
- **German Vocabulary Builder:** students are presented with a basic vocabulary of 500 words, including useful verbs, number words or common words for traveling or in the home. Groups of related words give learners context and similarity clues, which help increase foreign language skills. Lessons supplement introductory and/or refresher coursework.
- **Physics—Elementary Mechanics:** provides a problem-solving test in the elementary mechanics of physics. Students are shown a physical problem; then must "purchase" the missing information needed to answer it correctly. The emphasis is on *understanding* the problem, rather than just supplying the correct answers. Designed for senior high age level.



Question: What length of time does it take for the plane to reach Cuba?

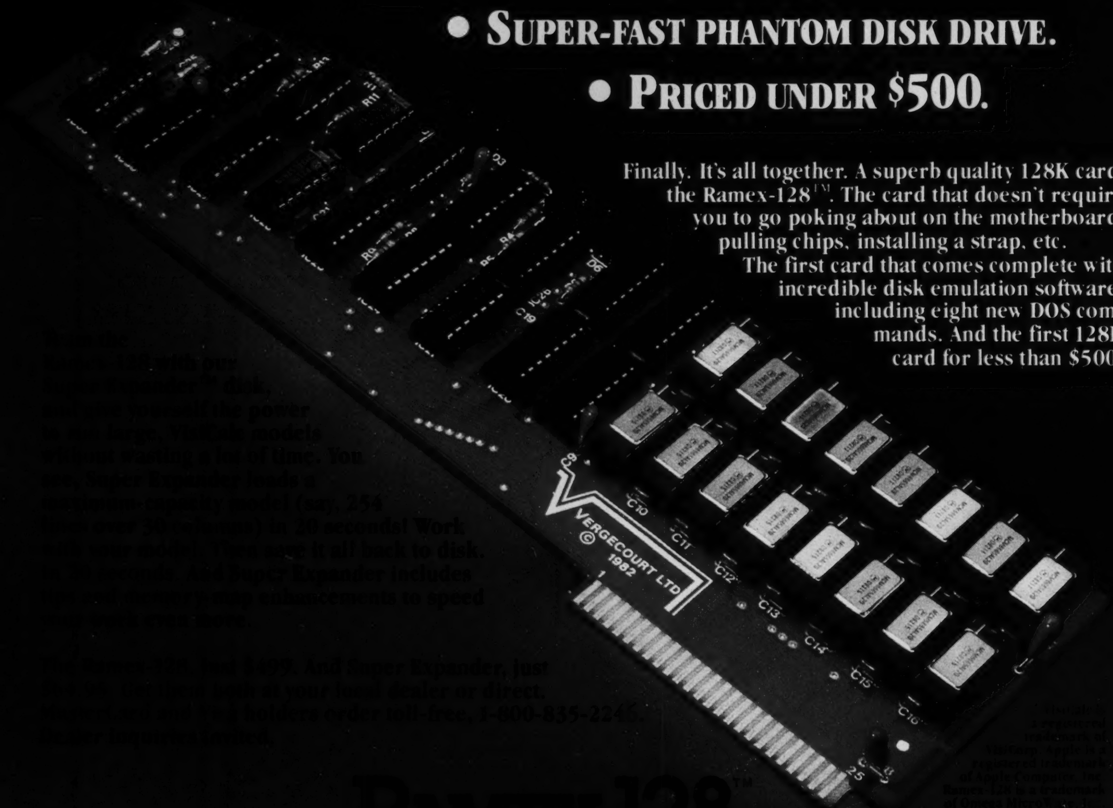
CONTROL DATA

PLATO
COMPUTER-BASED EDUCATION

CIRCLE 180 ON READER SERVICE CARD

Now here for your Apple®: A card that blows all the others away!

- Loads or saves a full VisiCalc® model in 20 seconds. (Not 16 minutes like the others)
- 136K for a VisiCalc model.
- Super-fast phantom disk drive.
- Priced under $500.



Finally. It's all together. A superb quality 128K card, the Ramex-128™. The card that doesn't require you to go poking about on the motherboard, pulling chips, installing a strap, etc.
The first card that comes complete with incredible disk emulation software, including eight new DOS commands. And the first 128K card for less than $500.

Team the Ramex-128 with our Super Expander™ disk, and give yourself the power to run large, VisiCalc models without wasting a lot of time. You see, Super Expander loads a maximum-capacity model (say, 254 lines over 30 columns) in 20 seconds! Work with your model. Then save it all back to disk. In 20 seconds. And Super Expander includes [illegible] memory-map enhancements to speed [illegible] even more.

The Ramex-128, just $499. And Super Expander, just $99. Get them both at your local dealer or direct. MasterCard and VISA holders order toll-free, 1-800-835-2246. Dealer inquiries invited.

VisiCalc is a registered trademark of VisiCorp. Apple is a registered trademark of Apple Computer, Inc. Ramex-128 is a trademark of Omega MicroWare, Inc.

Ramex-128™

Under $500. What are you waiting for?

OMEGA MICROWARE, INC.
222 SO. RIVERSIDE PLAZA • CHICAGO, IL 60606 • 312-648-4844
CIRCLE [illegible] ON READER SERVICE CARD

Talk is Getting Cheaper

John Anderson

Street Electronics
ECHO SPEECH SYNTHESIZER
ON OFF
VOLUME

Giving your computer the power of speech is no mere frill or gimmick. The potential of such capability, for the handicapped as well as microcomputer users at large, is dramatic.

For as long as microcomputers have been around, the cost of such potential has remained a prohibitive factor. But that is changing fast.

Following is a look at three speech synthesis packages for the Atari computer. These packages represent the range of possible configurations: the first is an independently powered piece of hardware, which can hook up to any microcomputer using a serial or parallel port; the second consists of an Atari specific external module, driven by software; the third works entirely in software, using the synthesizer chip already in the Atari.

The Echo GP

I have had an opportunity to experiment with the Echo Speech Synthesizer, from the Street Electronics Corporation, for quite a while now. It is a sophisticated unit, while at the same time fun to use.

It is based on the Texas Instruments TMS 5200 speech processor chip. This is in contrast with its nearest competitor, the Votrax Type 'n Talk, which uses the Votrax chip.

The unit makes use of its own 6502 microprocessor, and interfaces as if it were a printer. It is available in RS-232 serial or Centronics parallel versions. This means that the 850 interface is needed to drive the Echo from an Atari computer. We received the serial version, and controlled it through the 850 using Atari Basic.

Upon power-up, the Echo unit responds with the phrase "Echo ready," to let you know all is well. One of the first points the user will notice is that the Echo is capable of intoning a sentence. Rather than speaking in monotone, the pitch of the voice is dynamic. This makes for a more intelligible and less grating speech quality.

You can use the internal speaker of the unit or route the sound to an external speaker. I found it convenient (as did those around me) to use an earphone when involved in speech editing sessions.

Textalker

Textalker is the ROM based program Echo uses to convert English into speech. Echo can translate English text into phonemes directly, with an impressively low error rate. It can be disorienting, but even when Echo mispronounces a word or syllable, the listener can usually make sense of the sentence from its context.

This is not to say that Echo has the diction of Henry Higgins. In fact, it takes a bit of time to become accustomed to the unique "accent" of the unit. As is the case with some foreign speakers, accustomed listeners will typically understand words that first-time listeners will miss. Echo has trouble with the "g" sound in words like "go," and "l" sounds give it problems as well.

In this respect, the monotone of the Type 'n Talk wins out. (A thorough review of the Votrax unit appears in the

		Do	Re	Mi	Fa	So	La	Ti	Do
Octave 1	-	12	15	18	20	23	26	29	31
Octave 2	-	31	34	37	39	44	48	51	53
Octave 3	-	53	56	58	61	63			

Figure 1. A rough pitch table to give the synthesizer a singing voice. Flats and sharps can also be supported, but I have not taken the time to locate them.

```
10 REM ECHO SINGS ITS HEART OUT
20 REM ASSUMES SERIAL PORT IS OPEN AND CONFIGURED
30 DIM I$(100)
40 READ I$
50 IF I$="STOP" THEN STOP     1090 DATA THE
60 PRINT #1,I$                1100 DATA ¬29F
90 GOTO 40                    1110 DATA RAIN
1000 DATA ¬12F                1120 DATA ¬31F
1010 DATA SOME                1130 DATA BOW
1020 DATA ¬31F                1140 DATA ¬12F
1030 DATA WHERE               1150 DATA SKIES
1040 DATA ¬29F                1160 DATA ¬26F
1050 DATA OAV                 1170 DATA ARE
1060 DATA ¬23F                1180 DATA ¬23F
1070 DATA ER                  1190 DATA BLUE
1080 DATA ¬26F                1200 DATA STOP
```

Figure 2. With a singing synthesizer your micro won't be in Kansas anymore. The character " ¬ " is what control-e looks like on the screen.

September 1981 issue of *Creative Computing.*) Though it also has its share of vocal peculiarities, it does, on the whole, enunciate more clearly than the Echo. And yet, for extended periods, I would much rather listen to the Echo. The monotone of the Votrax unit gets me down after a while—too "computerish." It was an unfortunate design decision. The Votrax chip itself, as we shall soon see, does allow for software pitch control which results in much more natural sounding speech.

The features of Echo are accessed through control characters. For instance, pressing CONTROL-E will enable the Textalker command set. Following this character with a number from 1 to 63 will determine pitch, which can be toggled from f (for flat, meaning unintoned), to p (for pitched, meaning intoned). In what I think is a first for microcomputers, I found that the Echo could be programmed to "sing" through careful use of these commands. In fact, the unit provides for about three octaves. Not a bad range! A pitch table and sample program appear below.
be controlled by text punctuation. A comma will create a pause, a period will cause a drop in pitch at the end of a sentence, and a question mark will result in a rise in pitch.

Textalker can also be commanded to pronounce each punctuation mark it encounters. Similarly, the user may choose to have all upper case letters pronounced as letters (use this mode to get IBM to sound right), or to have all words spelled out letter by letter.

The rate of speech may also be compressed resulting in twice the text in the same amount of time. Remarkably, this function sometimes increases rather than decreases the intelligibility of certain sentences.

> ***I found that the Echo could be programmed to "sing."***

According to the documention, the Textalker component of the Echo Speech Synthesizer "contains close to 400 rules which allow it to correctly pronounce over 96% of the thousand most commonly used words in English."

I was pleasantly surprised at how well Echo did with unaltered text. Having worked with phonemically-based sythesizers in college, I realized this was quite a feat. Of course there are some words Echo has trouble with. Fortunately, an appendix, which outlines the kinds of fixes to apply to these words, is provided. They are as simple as the addition of a space, such as "cre ate" for the word "create," or the spelling of the word "question" as "kwestchun."

Phoneme Generator

In addition to the Textalker module, speech can be programmed at the phonemic level, using the Speakeasy Phoneme Generator, also resident in firmware. This mode is selectable by the character CONTROL-V, and provides for much more detailed control. Stress, pause, pitch, volume, and rate controls can be embedded directly into the text strings.

This approach requires the use of a phoneme code, detailed in the documentation. It bears little resemblance to any phonetic alphabet I have come into contact with, but the 48 sounds it provides are more than enough to do the job.

Unfortunately, the effort it takes to achieve satisfactory results using this approach is somewhat unreasonable, especially in contrast to the serviceable job Textalker does. However budding linguists should take note. The phonemic approach offers great experimentation potential. I did manage to get the Echo speaking a little German.

The Echo Speech Synthesizer lists for $300, which is admittedly a bit stiff. Still, it is comparable to the price of the Type 'n Talk. And if you want your micro to sing Thomas Dolby tunes, the Echo is the only choice.

Hooking Up

In March of this year *Creative* ran a review of the Echo Speech Synthesizer board for the Apple II. At that time, Textalker and Speakeasy were in the development stage. The Speech Synthesizer offers much greater flexibility and power, as well as the capability for connection to any personal computer.

However this does not automatically imply *easy* connection. Even with our experienced people here at the magazine, it took us a while to make the Echo conversant with the Atari.

The documentation that arrived with our Echo was preliminary. All the information we needed was there; I do hope that the final documentation will be an improvement, though.

The real fault lies with the 850 interface module documentation: it provides beginners with quite a run for their money. Here is a way to succeed.

The first thing to do is wire an interface cable, by connecting a DB-9 male to DB-25 male connector. The pinouts given in Figure 3 work with serial port number 1 on the 850.

Next you need to configure the Echo and port number one so that communication may be established. I used a data transfer rate of 1200 baud. This entails setting the DIP switches on the bottom of

1985 WAS NOT A VERY GOOD YEAR. THE RUSSIANS INVADED GERMANY, STORMED THE PERSIAN GULF, ATTACKED NORWAY, AND OVERRAN THE BALTIC.

INTRODUCING OUR NEW SERIES OF WARGAMES:

WHEN SUPERPOWERS COLLIDE!

SSI has just turned the Cold War into a very hot one. We've produced an entire line of wargames under the title: WHEN SUPERPOWERS COLLIDE. Each game in the series presents a different scenario of probable U.S.-Russia confrontations in various parts of the world.*

The first four releases are ***GERMANY 1985,™ RDF™*** *(in the Persian Gulf),* ***NORWAY 1985,™*** *and* ***BALTIC 1985.™***

Designed by Roger Keating, creator of SSI's highly-acclaimed SOUTHERN COMMAND,™ these strategy simulations boast the same successful look and play as his previous masterpiece: beautiful color graphic displays, easy-to-use movement system and realistic combat rules.

In GERMANY 1985, battalions of Soviet infantry, tanks, artillery units, and paratroopers have breached the southern center of West Germany through the Fulda Gap. NATO forces must contain and repel the Red invasion.

We've introduced several innovative rules to this game: Speed of movement is inversely proportional to the number of enemy units that can see you; smoke screens can be called upon to help cover an attack or retreat; and the concepts of HQ units, divisional integrity, and air superiority are fully incorporated.

For improved playability, the computer can actually move and fire for you. For example, if you wish to move from point A to B, simply order the computer and it will move the designated units along the most efficient path — stopping whenever enemy units are encountered. Or you can have the computer direct your artillery fire for you. In the solitaire mode, the computer can play either the Soviet or U.S. side.

GERMANY 1985 (at $59.95) is more than the standard bearer for our new series. Its rulebook contains all the rules for the rest of the line... which are priced at just $34.95 each! What you've got are four great modern wargames at unbeatable prices!

To see how you can decide the outcome of battle when superpowers collide, look for GERMANY 1985™ and company at your local game/computer store today!

**48K disc for the Apple® II with Applesoft ROM card.*

Apple is a registered trademark of Apple Computer Inc.

STRATEGIC SIMULATIONS INC

As part of our demanding standards of excellence, we use maxell floppy discs.

If there are no convenient stores near you, VISA and M/C holders can order direct by calling **800-227-1617, ext. 335 (toll free).** *In California, call 800-772-3545, ext. 335. To order by mail, send your check to: Strategic Simulations Inc, 465 Fairchild Drive, Suite 108, Mountain View, CA 94043. (California residents, add 6.5% sales tax.)* ***WRITE FOR A FREE CATALOG OF ALL OUR GAMES.***

CIRCLE 340 ON READER SERVICE CARD

Your greatest challenge lies ahead and downwards.
ZORK I
INFOCOM
The next step downward to danger.
ZORK II
INFOCOM
It all comes down to this.
ZORK III
INFOCOM
A LOCKED DOOR. A DEAD MAN.
DOCUMENTARY EVIDENCE
DEADLINE
STARCROSS

WE'RE WRITING

THEM AS FAST AS WE CAN!

At the rate we're going, we'll have these pages filled by 2083. And by 2084, people will be clamoring for the next Infocom creation.

We hate to disappoint our public. So we keep you waiting. Because while the software factories are cranking out arcade game after arcade game, pulpy adventure after trite fantasy, we're writing and rewriting, honing and perfecting. Before a single person enters one of Infocom's worlds, it must be crafted into a living, riveting, definitive experience.

Judging from the public's reaction, it's worth the wait. For instance, *Creative Computing* welcomed DEADLINE™ as "thoroughly engrossing and realistic," while a *Softalk* readers' poll recently voted ZORK™ I and ZORK II the most popular adventures of 1981.

And now, for the moment, your wait is over. ZORK III, your final step in the underground trilogy, and STARCROSS,™ an exploration of a new dimension in science fiction, are ready for you.

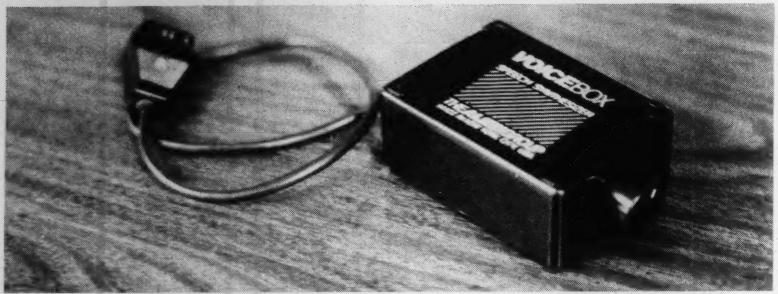
Look at them up there, the little worlds of Infocom. As our universe expands, companions will come to help fill that vast expanse of white space. Till then, they'll continue to stand alone as the best of all possible worlds.

INFOCOM™

55 Wheeler Street, Cambridge, MA 02138

Infocom's worlds are available for Apple,® Atari,® IBM, TRS-80,® Commodore, NEC, Osborne, CP/M,® and DEC.™

Apple is a registered trademark of Apple Computer, Inc. Atari is a registered trademark of Atari, Inc. TRS-80 is a registered trademark of Tandy Corporation. CP/M is a registered trademark of Digital Research, Inc. DEC is a trademark of Digital Equipment Corporation.



the Echo so that positions 1 and 2 are on, while position 3 remains off. Position 4 also remains in the off position to enable "handshaking," as we say in the trade.

The serial port is configured through software. Figure 4 shows an example of this configuration, as well as a short program allowing for straightforward experimentation with the unit.

Make sure the 850 device handler is booted whenever using the serial port. This occurs as an autorun.sys file on the Atari DOS disk. Make sure it is resident on any program disk for use with the unit. Power up the 850, then boot a disk with the handler file. You will then be set to go.

For more information concerning the Echo, contact Street Electronics, 1140 Mark Ave., Carpinteria, CA 93013.

Male DB-9 - (to serial port #1)	- Male DB-25 (to Echo GP)
Pin 1	No connection
Pin 2	No connection
Pin 3	Connects to pin 3
Pin 4	Connects to pin 2
Pin 5	Connects to pin 7
Pin 6	Connects to pin 20
Pin 7	Connects to pin 5
Pin 8	Connects to pin 4
Pin 9	No connection

Figure 3. Wiring a cable for connection to the Atari 850.

```
10 OPEN #1,12,0,"R1:"
20 XIO 36,#1,10,6,"R1:"
30 DIM I$(100)
40 I$="┐15P HI THERE. THIS IS ECHO G P.,, READY
   WHEN YOU ARE.,, OVER."
60 PRINT #1,I$
70 INPUT I$
80 PRINT #1,I$
90 GOTO 70
```

Figure 4. It is this simple to configure serial port number one and input text for synthesis. Again the " ┐ " character signifies control-e. Don't forget to boot the device handler prior to running the program.

The Alien Group Voice Box

The Echo has everything it needs to effect speech synthesis onboard. Like a printer, it awaits a stream of characters; it would just as soon pronounce text files from bulletin board services, Compuserve, or the Source. The Atari, thus, is free to do whatever processing you have in mind, while the Echo works independently.

This is a fine capability, but also an added expense. The Voice Box from Alien Group takes some of the internal, ROM based capabilities of the Echo, and efficiently uses Atari RAM for their storage. The Voice Box uses a Votrax SC-01 chip, and connects directly to the Atari input/output jacks. It will necessarily be the final connection in the I/O daisy chain, as it offers no jack of its own.

The external module is no bigger than a transistor radio, and draws power directly from the Atari. It lists for $170, including driver software, which is available in cassette or disk versions.

The Voice Box is manipulated from Atari Basic, and does not offer an RS-232 handler program. Using patches from Basic, however, it can be controlled from a machine language program.

Your machine must have at least 16K to run the Voice Box. If you have 32K or more, you can run two additional programs included with the package: the Random Sentence Generator and the Talking Face. More about these later.

When the driver program is run, the box responds with the phrase "Please teach me to speak," or if a dictionary is loaded, the words "Yes, Mahster," to let you know everything is working.

While calling on its own phonetic input code, as does the Echo, the system also uses a unique approach to convert character strings into speech sounds. English text and phonetic code may be freely intermixed, rather than requiring separate modes, as is without exception the case with every other text-to-speech system I have seen.

Dictionaries

The key to working with the Voice Box is the creation of your own *dictionaries*. These are the "word equations" specified to translate words into phonemes. For example, by typing "spek=speak," you will ensure that each time the word "speak" is encountered, it will be pronounced correctly. Dictionaries are saved and re-called, as independent files, to cassette or disk. In addition to those you create, three pre-written dictionaries are supplied with the driver software.

Dictionaries eat up computer memory quite quickly—each word equation takes up ten bytes. In order to store phonemes more effeciently, word *fragments* can be stored. You can define fragments to be recognized only at the beginning or the end of a word, or at every occurrence.

Because dictionary size is limited, the dictionary approach itself is necessarily limited. Even with 48K, no dictionary is going to produce impressively accurate text-to-speech capability. In this respect, the Echo has a much more sophisticated algorithm. This is the main trade-off between the two systems.

In fact, if you have more than 32K, you must change the dimensions of a string statement in the Voice Box driver program in order to store larger dictionaries. The documentation clearly states how to do this.

Other Features

Similar to the Type 'n Talk, the Voice Box sports a potentiometer knob on the front of the case, that can be used to vary the speed and pitch of the speech. The Voice Box unit allows for pitch control through software, too. Control is restricted to four registers, utilizing the slash and the backslash characters to move between them. This negates the musical capabilities of the unit, but is a step ahead of the monotone of the Type 'n Talk.

Because so much of the Voice Box is RAM resident, you must decide how much of the memory of the Atari to allot to dictionary space, in addition to your own Basic programs, and the Voice Box driver. The disk version includes a pared-down driver program for incorporation into other programs. The documentation also gives hints for memory conservation.

WE WILL NOT BE UNDERSOLD

SOFTWARE

MICROPRO	
Wordstar	$239.00
Mailmerge	$ 89.00
Customization Notes	$359.00
Spellstar	$239.00
Datastar	$199.00
Calcstar	$199.00
MICROSOFT	
Basic Interpreter	$349.00
Basic Compiler	$389.00
Fortran 80	$499.00
Cobol 80	$695.00
DATA BASE	
FMS80	$595.00
dBase II	$599.00

NEW! IBM PC SOFTWARE NEW!

INFORMATION UNLIMITED	
Easy Writer	$289.00
Easy Speller	$149.00
Easy Filer	$319.00
VISICORP	
Visicalc 256K	$199.00
VisiDex	$199.00
VisiFile	$229.00
VisiTrend/VisiPlot	$229.00
MICROPRO	
Wordstar	$239.00
MISCELLANEOUS	
Supercalc by Sorcim	$229.00
Superwriter by Sorcim	$289.00
Home Accountant Plus	$139.00
ENTERTAINMENT	
Deadline	$39.00
Temple of Apshai	$29.00
Curse of Ra	$15.99

Call For More IBM Software And Accessories

DISK DRIVES

CCI 100 for the TRS-80 Model 1	
5¼ 40 track	$299.00
CCI 189 for the Zenith Z-89	
5¼ 40 track	$379.00
CORVUS 5M with Mirror	$3089.00
CORVUS 10M with Mirror	$4489.00
CORVUS 20M with Mirror	$5389.00
CORVUS Interfaces	CALL
RANA SYSTEMS add-on Disc Drive for the Apple II	
Elite One 40 Track	CALL
Elite Controller	CALL
Elite Two 80 Track	CALL
Elite Three 80 Track double-sided	CALL

DISKETTES

Maxell 5¼ single side	$39.00
Maxell 8 single side	$49.00
Maxell 5¼ double side	$45.00
Maxell 8 double side	$55.00
BASF 5¼	$26.95
BASF 8	$36.00
Verbatim 5¼	$26.95
Verbatim 8	$36.00
Wabash 5¼	$21.95

IBM PC ACCESSORIES

64K Card by Microsoft	$435.00
Joystick by T & G	$49.00
128K Card	$579.00
192K Card	$629.00
256K Card	$699.00
Combo Card by Apparat	$249.00

Call for more IBM PC add-ons

For fast delivery, send certified checks, money orders, or call to arrange direct bank wire transfers. Personal or company checks require one to three weeks to clear. All prices are **mail order only** and are subject to change without notice. **Call for shipping charges.**

APPLE SOFTWARE

MICROPRO	
Wordstar	$199.00
Mailmerge	$89.00
Spellstar	$149.00
DataStar	$199.00
CalcStar	$189.00
VISICORP	
VisiCalc	$199.00
VisiTerm	$79.00
VisiDex	$199.00
VisiPlot	$169.00
VisiFile	$199.00
VisiSchedule	$259.00
VisiTrend/Plot	$239.00
MISCELLANEOUS	
Micro Courier	$219.00
Screen Director	$129.00
Executive Briefing System	$169.00
Supercalc	$199.00
Personal Filing System	$115.00
PFS Report Writer	$75.00
Word Handler	$169.00
ENTERTAINMENT	
Beer Run	$28.00
Zork I, II	$26.95
Deadline	$39.00
Chop Lifter	$24.95
Cannonball Blitz	$29.95
Knights of Diamonds	$29.95
Midnight Magic	$32.00
Wizardry	$45.00
Tuesday Morning Quarterback	$24.95
Crush, Crumble & Chomp	$24.95
Datestones of Ryn	$15.99
Morloc's Tower	$15.99
Snack Attack	$23.95
Star Blazer	$24.95

APPLE ACCESORIES

ADVANCED LOGIC	
Add-Ram 16K Card	$99.00
Z-Card CP/M for the Apple II	$225.00
Smarterm 80 Column Board w/Softswitch	$249.00
Z-80 Card by Microsoft	$319.00
16K Card by Microsoft	$159.00
32K Card by Saturn	$199.00
Keyboard Enhancer II by Videx	$125.00
Videoterm by Videx	$259.00
Game Paddles by TG	$49.00
Joystick by TG	$49.00
Numeric Keypad by Keyboard Co.	$139.00
ALF 9 Voice Board	$159.00
ALF 3 Voice Board	$229.00
System Saver by Kensington	$75.00
Versacard by Prometheus	$229.00
Microbuffer II 16K w/graphics	$259.00
Microbuffer II 32K w/graphics	$299.00
APPLE INTERFACE CARDS BY CCS	
Serial Asynch. #7710	$139.00
Centronics #7729	$149.00

Call for other CCS cards

RAM

16K Ram Kit for Apple II; TRS80 200 nano seconds, 4116 chips	$17.50

Dealer (National/International) Inquiries Invited.
Send for FREE catalogue

COMPUTERS

CALIFORNIA COMPUTER SYSTEM	
Mainframe 2200a	$485.00
Z-80 CPU 2810a	$265.00
64K RAM 2065	$569.00
Floppy Controller 2422a	$359.00
ZENITH	
Z-89 48K	CALL
Z-90 64K	CALL
Z-100	CALL
Call For Prices On The Complete Zenith Line	
CASIO FX702P Pocket Computer	$179.00
Sanyo MBC 1000 64K	CALL
Call For Prices On Complete Sanyo Computer Line	

PRINTERS

NEC 7710 Serial	$2395.00
NEC 7720 KSR	$2749.00
NEC 7730 Parallel	$2395.00
NEC 3510 Serial	$1850.00
NEC 3520	$2099.00
NEC 3530 Parallel	$1850.00
NEC 8023 Dot Matrix 100cps	$539.00
Epson MX-80	CALL
Epson MX-80FT	CALL
Epson MX-100	CALL
IDS Micro Prism	CALL
IDS Prism 80	CALL
IDS Prism 132	CALL
Okidata Microline 80	CALL
Okidata Microline 82A	CALL
Okidata Microline 83A	CALL
Okidata Microline 84	CALL
Datasouth 180 cps	CALL

MONITORS

Amdek 13" Color	$329.00
Sanyo 9" B & W	$135.00
Sanyo 9" Green	$140.00
Sanyo 12" B & W	$179.00
Sanyo 12" Green	$189.00
Sanyo 13" Color	$359.00
Zenith 12" Green	$105.00
Zenith 13" Color	$339.00
Electrohome 13" HI-RES Color Monitor	$829.00
Electrohome 13" Color	$349.00
Electrohome 12" B&W	$179.00
Electrohome 12" Green	$189.00
Electrohome 9" B&W	$149.00
Electrohome 9" Green	$159.00

SPECIAL OF THE MONTH
IDS MICRO PRISM
Dot Matrix – correspondence quality 110 CPS
Dot Plot Graphics CALL

TERMINALS

ADDS Viewpoint	$495.00
Zenith Z-19	$679.00
Televideo 910	$595.00
Televideo 925	$779.00
Televideo 950	$969.00

TELECOMMUNICATIONS

Prentice Star Modem	$129.00
Novation Cat Modem	$139.00
Novation D-CAT	$149.00
Novation AUTO-CAT	$199.00
Novation APPLE CAT	$299.00
Hayes Smart Modem	$249.00
Smart Modem 1200	CALL
Hayes Micro-Modem	$295.00
Hayes Chronograph	$225.00
Signalman Mark I	$85.00

The CPU Shop

TO ORDER CALL TOLL FREE 1-800-343-6522
420-438 Rutherford Ave., Dept. CR12 , Charlestown, Massachusetts 02129

Hours 9 AM – 9 PM (EST) Mon.-Fri. (Sat. till 6)
Technical information call 617/242-3361

TWX- 710-348-1796

Massachusetts Residents call 617/242-3361
Massachusetts Residents add 5% Sales Tax

CIRCLE 163 ON READER SERVICE CARD

In the 32K version, several other features appear. The first is the Random Sentence Generator. The Voice Box will compose random but grammatically correct sentences from its stored word lists. These can be modified with word lists of your own creation. I obtained some rather strange results in my attempts at this. While many were semantically bizarre, I must admit the sentences were grammatically unassailable. Be prepared for a few shocks when you try this.

There is also a mode called The Talking Face. This displays an animated face, with impressive lip synch simulated as words are articulated by the Box. I am sure this feature would be a big hit with the kids.

The documentation accompanying the system is a bit uneven in places, but manages to cover all the features of the Voice Box in a scant nine pages. The phoneme list is quite complete. The documentation also goes as far as to suggest to assembly language programmers a means of updating data to the box while running machine language animation routines.

While the Voice Box is not really in the same league as the Echo, it offers many of the same features for much less money. For more information contact the Alien Group, 27 West 23rd St., New York, NY 10010.

The game* Tumblebugs *taught the Atari its first words: "We gotcha!"

The Software Automatic Mouth

In the September 1982 issue of *Creative*, I mentioned that the Atari was capable of speech synthesis using only its internal hardware. The game *Tumblebugs* taught the Atari its first words: "We gotcha!" This came as a happy revelation to many.

Well with *Software Automatic Mouth, SAM* for short, Mark Barton has brought this possibility to fruition. He has created a disk-based, unlimited speech synthesis program, requiring *no* external hardware. And the speech quality of *SAM* competes favorably with the *best* systems available for microcomputers.

SAM uses the Atari sound chip, Pokey, to generate speech. Even with my unbridled faith in the capabilities of the Atari, I was quite surprised at how well it does the job. Pokey is at least as intelligible as its two competitors, the TI and Votrax chips.

SAM is the only package around that dares to include lengthy prepared speech demonstration programs to show off its articulative powers. My colleagues agreed that no break-in period was necessary in order to understand *SAM*.

The documentation supplied is equally impressive. It not only makes operation of the program very simple, but provides background information concerning linguistics and speech synthesis. It helps to make the program into an excellent tutorial on the subject.

I did encounter one snag, if only in my eagerness to get rolling with the package. You must copy all the Basic programs from the master disk to a new diskette. The autoboot assembly language program that constitutes *SAM* runs from the master, but support programs must be loaded from the new disk. The reason is that the support programs require a mem.sav file. The write-protected master disk will, of course, return an error if a mem.sav attempts to write to it. The documentation clearly states that you must use an un-write-protected new disk with a mem.sav file on it. In my excitement to get going, I did not heed these instructions, and ended up wasting some time.

Support programs included with the package are: Reciter, which is an English text-to-speech translation program; Sayit, the short Basic program which makes experimentation simple; Demo and speeches, two files that impressively demonstrate the powers of *SAM*; and Guessnum, a spoken version of a number-guessing game.

An RS-232 handler program is also provided, allowing *SAM* to act as Echo does to read telecommunications text.

It is extremely simple to work with *SAM* from Basic. All that is needed is to define SAM$ as it appears in Basic, and then invoke either *SAM* or Reciter through a USR call. You can also effect machine language patches from Basic.

Speech Quality

The really remarkable thing about *SAM* is its (his?) intonation—*SAM* can be extremely expressive. Control of stress placement is easy. The phonetic code is a bit strange, but very nicely laid out in the

SAM Speaks Apple II

The Apple II has no special advantage over the Atari when it comes to speech synthesis. The Echo, Votrax, and many other voice systems work equally well for both computers.

The history of software-only synthesizers for the Apple dates back to 1979 when Softape published a program called Apple Talker. That program has been discontinued, but Muse publishes The Voice, an inexpensive program that serves the same purpose. Sirius Software, the renowned game publisher, produces Audex, a general purpose audio program that can be used to approximate speech. For the most part, these programs deliver results that are interesting, but only sporadically intelligible.

Hardware voice products for the Apple also abound. Voice input can be recognized by peripherals from Scott Instruments, among others. Mountain Computer carries a remarkable input-ouput device that turns an Apple into a digital audio recorder.

At $130 for the Apple version, SAM is the first product to combine unlimited vocabulary, impeccable intelligibility, and reasonable price.

The SAM package includes a little bit of hardware and a little bit of software. The hardware is a board containing a digital-to-analog converter, a tiny amplifier, and an even tinier volume control. The software includes all the programs described in the main part of this article.

SAM sends output to an 8-ohm speaker. You can use the speaker inside your Apple or, for better results, attach a slightly larger one. Installing SAM is no more complicated than hooking an Apple to a TV set.

SAM uses the simplest possible interface to a sound system. In exchange for the simplicity of the hardware, the developers had to write large and complex programs. The program that produces speech based on phonetic codes occupies 9K of RAM. Another program that translates English text into phonetic codes requires an additional 6K. These programs live in an area usually reserved for Applesoft string variables. The English translator also overlaps the memory associated with the second graphics image (Hi-Res page 2) of the Apple.

Because of these requirements, SAM can not cooperate with most other programs. You can not add speech capability to your word processor or terminal program, for example. Pascal, Logo, Graforth, and most other languages can not use SAM.—*MC*

Great Plains Accounting/Management Software

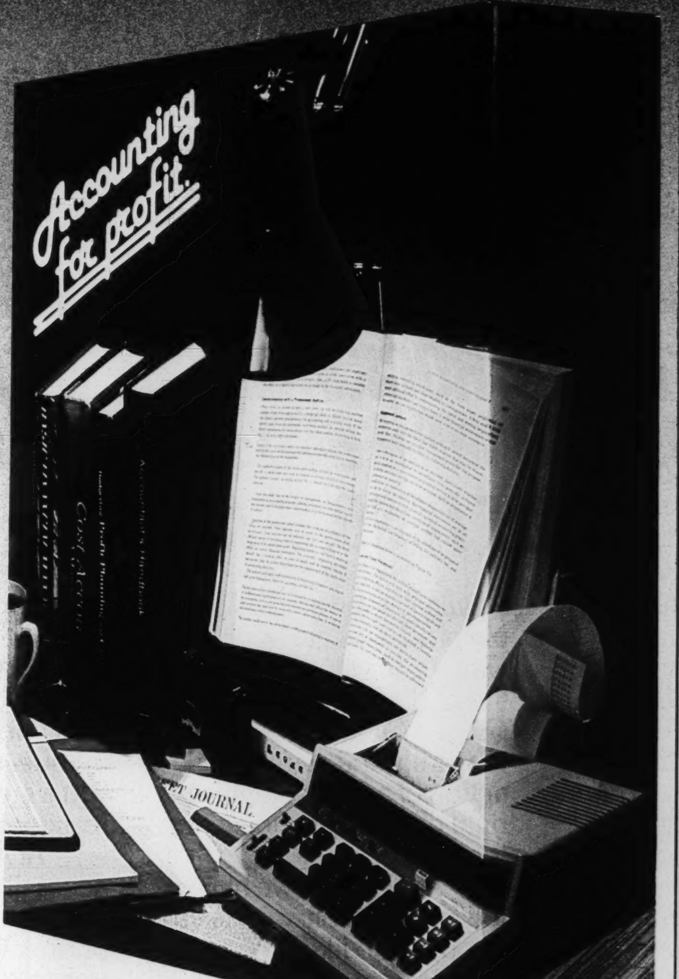
ACCOUNTING FOR PROFIT

Most business people know that there are two ways to improve business profits: sell more or spend less. The Hardisk Accounting Series from Great Plains Software does both. And your profits will never be better!

Great Plains Software improves business profits because it accounts for them. Your profit centers are isolated and unnecessary losses are avoided – whether you're using General Ledger, Accounts Payable, Accounts Receivable, Payroll or Inventory with Point-of-Sale.

The Hardisk Accounting Series is fast, powerful and operates on popular microcomputers. Don't trust your company's profits to any software other than Great Plains Software. When it's time to see profits, the Hardisk Accounting Series is accountable!

Call or write your local computer store dealer or Great Plains Software for more information on how you can account for your profits!



Hardisk Accounting Series

SPECIFICATIONS

OVERALL

Password Privacy System
Written in UCSD Pascal**
Hard Disk Oriented
Operates on Apple III, IBM PC

GENERAL LEDGER

All entries on line entire fiscal year
Flexibly formatted financial statements
Comparative income statements and balance sheets

ACCOUNTS RECEIVABLE

Up to 32,768 customers*
Profit by customer, customer type, salesman and state
Open item or balance forward
Automatically posts to G/L

ACCOUNTS PAYABLE

Up to 32,768 vendors*
Accommodates manual or generated checks
Automatically posts to G/L

PAYROLL

Up to 32,768 employees*
Up to 25 deductions per employee
Withholding computed
Prints W2, 941 and checks

INVENTORY

FIFO, LIFO, standard cost, weighted moving average and serial number valuation
5 price levels per part
Concise report including profit by part and line
Point of Sale for cash and credit sales
Part numbers up to 15 characters
Automatically posts to A/P and A/R

**depending upon disk storage space*
***TM UC Regents*

GREAT PLAINS
SOFTWARE

123 15 Street N., Fargo, ND 58102
Telephone (701) 293-8483

Inventory
Accounts Receivable
General Ledger
Accounts Payable
Payroll

CIRCLE 201 ON READER SERVICE CARD

DODGING TREES, ROCKS, CHICKENS, AND COPS AT OVER 80 MPH MAY NOT BE LEGAL.

BUT IT SURE IS FUN!

Grab the wheel in *Hazard Run,* our high-speed cross-country chase . . . and watch the feathers fly! It's just one example of the high-involvement exciting game software created by Artworx. At Artworx, we're directly involved with the software we sell. We know our game software is fun to play because our own people can't keep their hands off it. We created *Beta Fighter* to simulate a moonscape battle that will literally take you out of this world! Our *Drawpic* software lets people of all ages get hooked with the limitless possibilities of graphic creation. *Golden Gloves* gives you all the thrills and slam-bang action of a super slugfest, right down to the noise of the crowd!

At Artworx, we have a full range of software . . . for people who like to play and people who want to turn work into play. We have text editing, mail list, and analytical programs, to name but a few. How good are they? We use them in our own business . . . and we welcome your comments and suggestions. We pride ourselves on a line that's complete, unique, diverse, and offers you a great value for a very reasonable price.

At Artworx, we're as accessible as your local computer store or your telephone. Write or call us toll-free at 800-828-6573. We'll send you our free catalog . . . it's good reading and a great introduction to a whole new world of fun.

Artworx™
So you can play.

Artworx Software Company, Inc., 150 North Main St., Fairport NY 14450 (716) 425-2833
For Atari 16K—Hazard Run $27.95 • Beta Fighter $17.95 • Drawpic $29.95 For Atari 24K—Golden Gloves $22.95 Add $4 for disk, Add $2 for postage and handling

Figure 5.

PHONETIC ALPHABET FOR S.A.M.

The example words have the **sound** of the phoneme, not necessarily the same letters.

VOWELS

IY	f**ee**t
IH	p**i**n
EH	b**e**g
AE	S**a**m
AA	p**o**t
AH	b**u**dget
AO	t**al**k
OH	c**o**ne
UH	b**oo**k
UX	l**oo**t
ER	b**ir**d
AX	gall**o**n
IX	dig**i**t

DIPHTHONGS

EY	m**a**de
AY	h**igh**
OY	b**oy**
AW	h**ow**
OW	sl**ow**
UW	cr**ew**

VOICED CONSONANTS

R	**r**ed
L	a**ll**ow
W	a**w**ay
WH	**wh**ale
Y	**y**ou
M	Sa**m**
N	ma**n**
NX	so**ng**
B	**b**ad
D	**d**og
G	a**g**ain
J	**j**u**dg**e
Z	**z**oo
ZH	plea**s**ure
V	se**v**en
DH	**th**en

UNVOICED CONSONANTS

S	**S**am
SH	fi**sh**
F	**f**ish
TH	**th**in
P	**p**oke
T	**t**alk
K	**c**ake
CH	spee**ch**
/H	a**h**ead

The following symbols are used internally by some of S.A.M.'s rules, but they are also available to the user.

YX	diphthong ending
WX	diphthong ending
RX	R after a vowel
LX	L after a vowel
/X	H before a non-front vowel or consonant
DX	"flap" as in pi**t**y

SPECIAL PHONEMES

UL	sett**le** (= AXL)
UM	astron**omy** (= AXM)
UN	functi**on** (= AXN)
Q	kitt**-**en (glottal stop)

Note: The symbol for the "H" sound is **/H**. A glottal stop is a forced stoppage of sound.

Figure 6.

```
0 GRAPHICS 0
10 REM --DEMO--
20 DIM SAM$(255):SAM=8192
25 X=0
30 SETCOLOR 2,0,0:SETCOLOR 1,0,0:SETCOLOR 4,0,0:SETCOLOR 3,0,0
40 SPEED=8208:PITCH=8209
45 X=X+5:IF X>45 THEN X=0
50 POKE SPEED,X:POKE PITCH,100
60 SAM$="ULEHKTRAA4NIXK /HULUW4SIXNEY5SHUNS."
70 A=USR(SAM)
80 GOTO 45
```

documentation (see Figure 5). A reference card is also provided.

Similar to the Echo, punctuation is "understood." A hyphen is read as a short pause, and is handy for delineating clause boundaries. A comma inserts a pause equivalent to two hyphens. A question mark also inserts a pause, as well as making the pitch rise at the end of a sentence. Likewise a period makes the pitch fall.

SAM is capable of speaking only 2.5 seconds without a break. If a string exceeds that length, a short break will automatically be inserted. If you don't like the placement of automatic breaks, you can stipulate their positions with hyphens. The breaks are so short as to be hardly noticeable, and cause few problems.

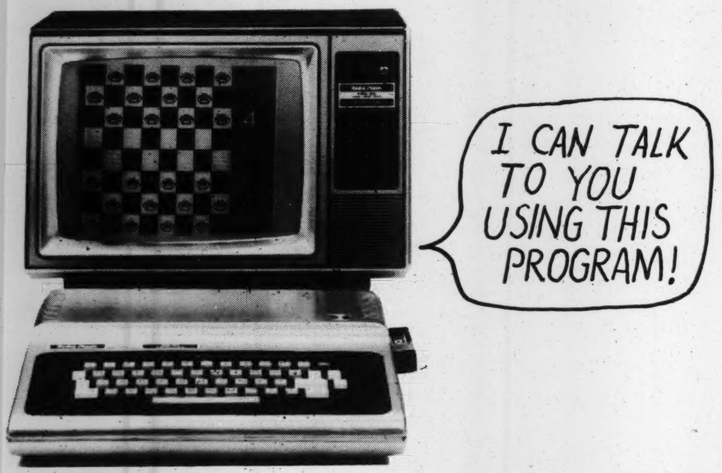
SAM can be controlled more creatively and flexibly than Echo or Voice Box. The pitch and speed of *SAM* speech can be altered through with POKE statements. I got some wild results playing with these. A sample program, Figure 6, shows how speed effects can be achieved.

The timbre of speech can be varied to make *SAM* sound quite human—or like a droid from *Star Wars*.

An 18-page English-to-phonetic code dictionary appears in the documentation to help in speech programming. In addition, *SAM* flags phoneme input errors. When a bad phoneme occurs in the immediate execution mode, an error is flagged in the same way as syntax errors in Basic. By PEEKing decimal address 8211, you can trace these problems when they occur in the deferred mode.

At the incredible price of $60, there must be a catch, right? Well there is, sort of. Because *SAM* uses the Atari to do all its work, DMA is shut down during articulation. This means the screen goes blank during speech—no animation, no text, nothing. The documentation tells you how to re-enable DMA during speech, but warns that this distorts *SAM's* speech rather badly. However, this blanking takes place only during articulation. As soon as a string is finished, DMA returns and all is normal.

I cannot overstate how impressed I am with the *Software Automatic Mouth*. It is a remarkable feat of software savvy, and probably one of the best buys available for the Atari computer. Its higher-priced competitors have their advantages, but would do well to strive for the same strong documentation this package has. If you wish to give your Atari the power of speech, have a disk drive, and are on a limited budget, look at this program. For more information, contact Don't Ask Software, 2265 Westwood Blvd. Suite B-150, Los Angeles, CA 90064. □



The Color Computer Speaks

Scott L. Norman

creative computing
SOFTWARE PROFILE

Name: Compuvoice
Type: Speech synthesizer
System: 16K or 32K TRS-80 Color Computer
Format: Cassette
Language: Machine language
Summary: Inexpensive way to add speech to programs
Price: $44.95
Manufacturer:
Spectral Associates
141 Harvard Ave.
Tacoma, WA 98466

Speech synthesis has recently received a great deal of attention as an alternative computer output technique. Owners of personal computers have been able to get in on the action, but only at the cost of installing specialized hardware. Now, Spectral Associates' *Compuvoice* gives owners of TRS-80 Color Computers a chance to explore the uses of machine speech with a completely software-based system.

Compuvoice is a machine language program for phoneme synthesis. It resides in protected high memory, where it can be called from Basic programs. I shall demonstrate the syntax a little later in this review, but for now it is enough to say that the argument of the user call statement is a string built from the symbols which *Compuvoice* uses to represent phonemes. The construction of such strings should be very familiar to Extended Color Basic devotees, as it resembles the way in which DRAW and PLAY commands are put together for graphics and musical effects.

Since this isn't a whodunit, I will answer the ultimate question first: Is *Compuvoice* any good? My opinion is that the program is indeed useful, if only as an experimental vehicle. The selection of phonemes for any particular application requires a great deal of experimentation, and even with the greatest of care there can be problems with the intelligibility of particular phrases.

Figure 1. The author's SOUNDEMO program for experimenting with Compuvoice.

```
1000 DEF USR0=&H7F00
1005 A=PEEK(65315): POKE 65315, A OR 8
1010 X$(0)="/ZZIIRR/OO/"
1011 X$(1)="/>W61NN/"
1012 X$(2)="/T.UU/"
1013 X$(3)="/8RREEY/"
1014 X$(4)="/FOO>R/"
1015 X$(5)="/F66IEV/"
1016 X$(6)="/S>IK/SS/"
1017 X$(7)="/S>1V<1NN/"
1018 X$(8)="/AAYT./"
1019 X$(9)="/N66IEN/"
1020 CLS: INPUT "DIGIT OR PHONEME(S)"; AN$
1025 IF LEFT$(AN$,1)="D" THEN 1030 ELSE IF LEFT$(AN$,1)="P" THEN 1045 ELSE 1020
1030 CLS: INPUT "DIGIT";N
1035 A$=USR0(X$(N))
1040 GOTO 1020
1045 CLS: INPUT "PHONEME(S)";P$
1050 X$="/"+P$+"/"
1055 A$=USR0(X$)
1060 GOTO 1020
```

Scott L. Norman, 8 Doris Rd., Framingham, MA 01701.

V new for Apple II™

I. APPLEsurance II. . .

DUAL AUTOMATIC DIAGNOSTIC AND ASSURANCE SYSTEM

The only double-safe system now available for insuring the reliability, integrity, and dependability of your Apple II and peripherals. Identify problems before you lose time and data. APPLEsurance II includes:

(1) A standard disk controller card which also automatically runs sophisticated diagnostic routines on basic system hardware each time you power-up. Descriptive error messages indicate any problem areas and, in some cases, the specific chip or component that's responsible.

(2) Disk based diagnostic and assurance tests for further and more extensive checks of the basic hardware plus elaborate standard and optional analysis of peripheral cards and sub-systems.

APPLEsurance II suggested list prices:

Complete System with Disk Controller Card and Disk Based Software	**$150.00**
Disk Controller Card with Power-Up Diagnostics only	**$125.00**
Disk Based Software only	**$50.00**

IV. VERSAcard. . .

FOUR CARDS ON ONE + TWO NEW OPTIONS

NOW! The four separate card functions – with true simultaneous operation – that made VERSAcard the preferred multifunction card for Apple II – (1) Serial Input/Output Interface (2) Parallel Output Interface, (3) Precision Clock Calendar, and (4) BSR Control – PLUS NEW OPTIONS: Screen Dump Graphics ROM and BSR Time and Event Program.

VERSAcard suggested list price **$199.00**
Options extra.

II. GRAPHITTI. . .

GRAPHICS/PARALLEL PRINTER CARD

Sophisticated text and graphic routines available via simple keyboard commands. Avoid "squashed" printouts. GRAPHITTI on-board firmware lets you utilize the Apple high resolution graphic screens – circles are printed as circles. Use with most of today's popular dot-matrix printers. Graphic support for Epson, Okidata, NEC 8023, C-Itoh Prowriter, and IDS Prism. Compatible with most software packages including PFS:Graph,™ CP/M,™ and Apple Pascal.™

Firmware 'text' features include: Set Line width via standard ^InN format, Enable or Disable Line Feed after Carriage Return, Set Lines per Page, Set Left Margin, Set or Clear 8th Bit. Print High Resolution Page 1 and/or 2, Double Size, Emphasized Mode, Inverse Mode, Rotate 90 Degrees, Specify Left Margin . . . and more.

GRAPHITTI Graphics/Parallel Printer Interface
Suggested list **$125.00**

V. EXPAND–A–RAM. . .

16K to 128K EXPANDABLE RAM CARD

A low cost solution to future larger memory needs. Start with 16K (**$225**), 32K (**$249**), or 64K (**$375**), and expand to 128K later. Or, simply order the full 128K size now (**$495**). No Apple modification required. All cards include memory management software, ram test, and utility functions. Disk Emulators for Apple DOS,™ Apple Pascal,™ and CP/M™ available. Optional: Expand Visicalc™ to 128K and 80 column format.

Apple II is a registered trademark of Apple Computer, Inc.

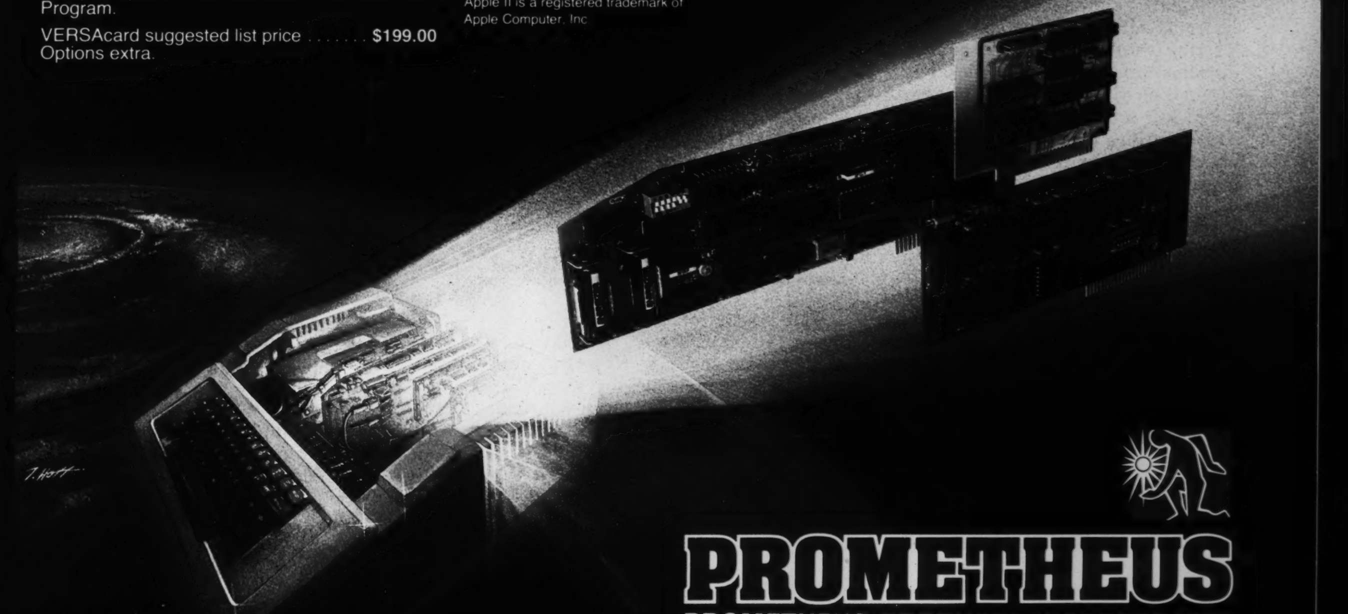
III. VERSAbox. . .

THE ONLY INTELLIGENT SPOOLER/BUFFER WITH AN OPTIONAL REAL TIME CLOCK INTERFACE DISPLAY

For use with all Centronics parallel and RS-232C INPUT/OUTPUT interfaces. VERSAbox's high-speed input combined with up to 60K buffer (more with character compression) frees up your computer from the slow job of printing. Modems and other compatible devices can also be buffered. Multiple software selectable outputs permit you to choose between two or more VERSAbox outputs or use them simultaneously. You can buffer multiple inputs simultaneously too.

Add the optional REAL TIME CLOCK to VERSAbox and you get a six digit LED numeric time display. Your computer can read the time via the RS-232C port. Another useful option is the SWITCHED 120V SOCKET that can turn external devices on and off by clock control.

Cabinet is 11"W, 8"D, 8"H. VERSAbox suggested list price with 16K buffer
$249.00 Options extra.



PROMETHEUS

PROMETHEUS PRODUCTS INCORPORATED
45277 Fremont Blvd. • Fremont, CA 94538 • (415) 490-2370

CIRCLE 253 ON READER SERVICE CARD

It is important to appreciate the limitations of such a software-based system. A really good hardware system can run (talk?) rings around it, but at an order of magnitude higher price. Keep this tradeoff in mind as I describe my experiences with the program.

Starting Out

Compuvoice comes on a cassette, but can easily be transferred to disk since its memory requirements do not conflict with those of Radio Shack Color DOS. The instruction leaflet gives the addresses required for the SAVEM command. Versions intended for both 16K and 32K machines are included.

The program is not small, it requires 8336 bytes of RAM. Thus, if you wish to use it in a 16K system, you must sacrifice some video storage. A PCLEAR1 or PCLEAR2 command will probably be necessary.

In any case, having loaded the speech synthesizer for the first time the user is naturally eager to put it through its paces. The cassette includes a Basic program, VDEMO, which can be used for a quick demonstration. You are asked to type a number from 1 to 9; the computer responds to the Enter command by pronouncing the number.

Frankly, the first time around I was slightly disappointed. My first encounter with personal computer speech synthesis, not too long before buying *Compuvoice*, had involved a demonstration of a Votrax Type 'n Talk, which is superior in intelligibility, naturalness of inflection, and other factors.

Compuvoice produces a very mechanical, uninflected baritone, and, as I shall describe shortly, there are persistent problems with certain phonemes. Nevertheless it provides a basis for experimentation, so I set out to use VDEMO as a guide to writing my own test program for further work. The result, SOUNDEMO, appears in Listing 1.

There is certainly nothing remarkable about this program, but it does illustrate some syntax requirements as well as two ways of constructing phoneme strings. The initialization lines involving the DEF USRO and the PEEK and POKE are required in any *Compuvoice* application.

The former sets up the system for a subsequent machine language program call, while the PEEK/POKE combination forces a 1 in the Bit 3 position of address 65315 to enable the 6-bit sound output. A word of warning: The *Compuvoice* instructions contain a typo, showing this command as ...OR B rather than ...OR 8. The actual calls to *Compuvoice* are the A$=USRO(X$) commands, whose syntax is fixed.

The phoneme string X$ can be generalized to be an array, though, and that's how the digit-pronounciation portion of the program, accessed by entering D, works. The Nth member of the array is simply the string whose pronounciation gives the number N. The strings are defined in lines 1010-1019; obviously, code symbols are used for some of the phonemes.

CODE	AS IN	CODE	AS IN
A	dAy	2	fIRst
E	kEY	3	pUt, lOOk
I	It	4	At
O	Oh	5	pEt
U	tOO	6	fAther
1	cUt	7	pAW
B	Bat	N	Nice
D	Die	P	Pat
F	Fat	R	Rat
G	Get	S	Sat
H	Hat	T	aT
J	Jam	V	oF, caVe
K	Cat	W	Wire
L	Like	Y	Yellow
M	Mat	Z	Zoo
8	maTH	Q	thiNK, briNG
9	SHe	C	CHair
X	THe,THem		

. Glottal (Partial) stop
/ Full Pause
Lengthens next phoneme 50%
Shortens next phoneme 50%

Figure 2. Table of Compuvoice Phoneme and Control Codes.

Compuvoice produces a very mechanical, uninflected baritone.

This portion of SOUNDEMO is very much like VDEMO, except that I have altered some of the X$(N) to give what I consider to be more pleasing sounds. The manual lists the strings which the vendor uses for the digits; I doubt that anyone would argue with the idea of altering these things to suit the user's taste.

For general experimentation, the prompt should be answered with P (for phoneme). The next input is treated as a string of phoneme codes, concatenated with the mandatory "/ and /" delimiters, and pronounced. This makes a fairly convenient tool, although a one-key automatic repeat of the last string entered would probably be a useful modification.

Through the Phonemes

In Figure 2 I have listed the 35 phoneme codes and four control characters used by *Compuvoice*. Realize at the outset that this is less than a complete representation of natural English; I believe the official number of English phonemes is something like 44. Thus you can expect some compromises to have been made in the clarity of reproduction. In general, the intelligibility of synthesized speech increases as you live with the system.

The construction of phoneme strings for application to any specific program takes time. Your best bet (and this is stressed in the manual) is to listen critically as you pronounce the words you want to program. You will find that many sounds which you might think of as simple are actually quite complex, and require several phonemes and/or control codes for decent reproduction.

For example, notice that there is no one-keystroke representation of the long i in hi. Linguistically, this is usually characterized as a diphthong, but listen carefully and I think you will agree that there are really three sounds: a broad a as in "father," a short i as in "it," and finally a long i is 66IE.

Each user will probably have his own observations about the accuracy of the

KNIGHT of DIAMONDS
Austin
WIZARDRY™

THE SECOND SCENARIO

The Wizardry **Adventure Continues!** Barbarians gather, preparing to sack the city of Llylgamyn. News that the mighty staff of Gnilda has been reclaimed by its earthgod creator has travelled fast. Protected for a thousand years by the power of the wonderous artifact, and now defenseless, Llylgamyn is doomed, unless you help!

What have people said about the first scenario?

[Wizardry] has the potential to become a classic.
David Lubar, *Creative Computing*

The most eagerly awaited adventure . . .
Computer Merchandising

. . . perhaps the most advanced adventure program on the market.
Forest Johnson, *The Space Gamer*

The amount of detail is fantastic.
Neil Shapiro, *Popular Mechanics*

Knight of Diamonds, a challenging scenario for experienced *Wizardry* players (13th level characters will barely survive!).

Proving Grounds of the Mad Overlord (shown at right) and *Knight of Diamonds* operate on **any** Apple Computer* with at least 48K, DOS 3.3, and 1 disk drive.

Proving Grounds of the Mad Overlord—**$49.95**

Knight of Diamonds—**$34.95**

MasterCard VISA C.O.D.

Join over ten thousand adventurers exploring the ultimate fantasy experience.

Shipping $2.00 in U.S.; $5.00 outside U.S.

NOW AVAILABLE AT YOUR LOCAL COMPUTER AND HOBBY STORE

*APPLE IS A REGISTERED TRADEMARK OF APPLE COMPUTER, INC.

Sir-tech SOFTWARE, INC.
6 MAIN STREET, OGDENSBURG, N.Y. 13669
(315) 393-6633

CIRCLE 275 ON READER SERVICE CARD

stock phonemes; here are a few of mine. Capital letters represent the phoneme codes, while quotation marks will be used to set off the sounds themselves.

- A - This isn't a really good "long A" as it stands; it is much better when followed by E.
- 1 - Not quite right for the "short U" it supposedly represents. The sound is too nasal, somehow.
- 5 - This is supposed to be the "short E", but it is really very close to the "short I" represented by the symbol I itself. Come to think of it, though, my wife tells me that she hears little difference between these vowels in normal speech anyway.
- L - Not too accurate; sound is rather "buzzy."
- X and 8 - These are supposed to reproduce the two sounds of the TH blend. In practice, 8 is very good while X gives a rather nondescript sound. In fact, XX is a better reproduction of the "L" sound than the L code itself!
- D - Comes out very much like B.

This brings up a point about the reproduction of consonants, which is that *Compuvoice* has a certain amount of trouble with the plosives (P and B, for instance) and the fricatives (such as T). I can't prove it, but I suspect this may have to do with the bandwidth required for accurate reproduction of these sounds being in excess of the capabilities of the program or the Color Computer.

In any case, I have found that judicious use of the glottal and full stop control codes improves intelligibility. Thus the number 2 is better represented by T.UU than by TUU, "Pie" should be P.66IE rather than P66IE, and "pat" is best rendered by P.44/T. (That last symbol is a period, not a glottal stop code.) Finally, both the single code C and the recommended combination TC are too "buzzy" for accurate representation of the CH blend; a much better sound is produced by the T/9 code combination.

> ***I have found that judicious use of the glottal and full stop control codes improves intelligibility.***

Summing Up

As I said at the beginning of this review, I have found *Compuvoice* to be worth the effort it takes to generate reasonably intelligible messages. Thus far, my own applications have been principally to game programs, where audio messages seem to fit in most easily. I expect to explore the use of audio prompts in other areas, such as household programs, in the near future.

Some performance problems remain. *Compuvoice* doesn't appear to do any elaborate filtering of the audio between phonemes, so there are sometimes audible "thumps" at vowel/consonant transitions. In general, I must say that the performance penalty incurred by using this system, relatie to specialized hardware, is probably appropriate to the price differential. The $375 commanded by Type 'n Talk is a little steep if you only want to experiment with the possibilities of machine speech.

One more point. I find the speech produced by *Compuvoice* to be too fast-paced. I have, therefore, become a great exponent of repeated phoneme codes to slow things down—at least for vowels. Once again, pauses and stops can be used to stretch sounds out and make consoants clearer. My problem, if that's what it is, probably arises from my upbringing in the relatively low-key Midwest; I just wonder how many vowel repeats it would take to make a real slow-drawling Texan or Oklahoman comfortable. ☐

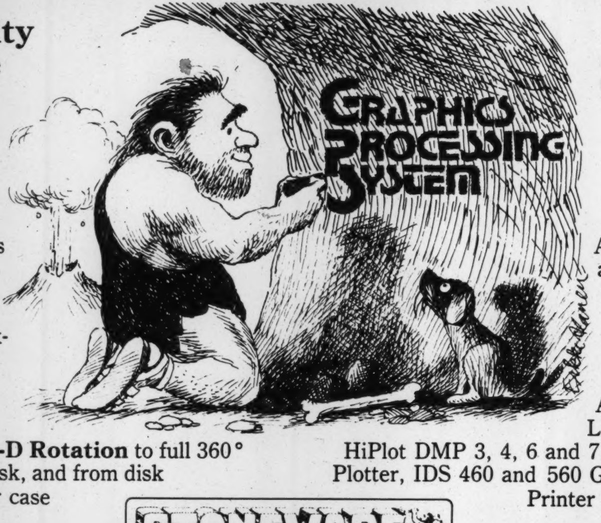
See Us At
COMDEX
Nov. 29-Dec. 2, 1982
Las Vegas Convention Center
Las Vegas, Nevada

STONEWARE'S AMAZING NEW GRAPHICS PROCESSING SYSTEM

Professional quality graphics for the Apple II Plus.

After two years of development, Graphics Processing System is the ultimate in fast, low cost, easy-to-use graphics programs. Graphics Processing System creates and edits images in the same manner word processors work with text.

Graphics Processing System features: **Grid Maker** for working with scale and proportion ■ **Colors** can be mixed and used to color lines, objects and backgrounds ■ **Two Zoom** powers for greater detail resolution ■ **2-D Rotation** to full 360° ■ **Duplication** on screen, to disk, and from disk ■ **Text Capabilities** in upper case A-Z, 0-9, and all characters on the Apple keyboard ■ **Modify or Erase** a portion of an image without having to start from the beginning ■ **Enlarge or Reduce** images ■ **Change Proportions** vertically and/or horizontally ■ **Print Overlays** separately and in different colors ■ **Accesses** 16K RAM card ■ **Compatible** with other Apple HiRes graphics ■ **Uses** Apple compatible game paddles and joystick ■ **Speaks** directly to The Apple Silentype printer and accommodates graphic dump programs for other printers ■ **Professional Version** is also compatible with Apple Graphics Tablet, Symtec Light Pen, Houston Instruments HiPlot DMP 3, 4, 6 and 7, HP7470A Plotter, Strobe 100 Plotter, IDS 460 and 560 Graphics Printers, Epson MX80 Printer with Graphtrix.



STONEWARE INCORPORATED®
50 Belvedere Street, San Rafael, CA 94901 (415) 454-6500
© 1982 Stoneware Incorporated. TELEX II: 910-384-2016 STONEWARE SRFL

Only **$179.** for Professional Version and **$69.** for Standard Version.

Requires 48K Apple II Plus, one or two Apple Disk drives, B&W or color screen, game paddles or joystick. Optional: 16K RAM Card or Language Card, Apple Silentype or other B&W or color printer. GPS is available through leading software distributors and Apple Dealers. Or send check, money order, Visa or MasterCard (include expiration date) to Stoneware Incorporated. California residents add 6% sales tax.

Reg. Trademarks: Apple: Apple Computer, Inc.; Symtec: SYMTEC, Inc.; HiPlot: Houston Instruments Div. of Bausch & Lomb; HP7470A: Hewlett-Packard Co.; Strobe 100: Strobe, Inc.; IDS 460 & 560: Integral Data Systems, Inc.; Epson MX80: Epson America, Inc.

CIRCLE 339 ON READER SERVICE CARD

Star Maze, a tour-de-force of hi-res animation and graphics. Yours is a desperate mission—to find and recover the power jewels hidden in the maze before your fuel runs out.

Star Maze features animation effects never seen before on an Apple as well as the fine touches that mark it as a Sir-tech game.

- huge 18 color multi-directional maze
- 16 maze levels
- playable by keyboard, paddles, joystick or joyport
- high scores saved to disk
- and more . . . all for $34.95

Programmed by Gordon Eastman from an original design
by Robert Woodhead

NOW AVAILABLE AT YOUR LOCAL
COMPUTER AND HOBBY STORE

MasterCard VISA C.O.D.

Shipping $2.00 in U.S., $5.00 outside U.S.

SOFTWARE THAT COMPLIMENTS YOUR INTELLIGENCE

SIR-TECH SOFTWARE INC.
6 MAIN STREET
OGDENSBURG, N.Y. 13669
(315) 393-6633

CIRCLE 276 ON READER SERVICE CARD

FRANK CASEY
3181
DATE
19
Northern Bank
DOLLARS
RESET
RETURN
SHIFT
SHIFT
POWER

We don't care which computer you own.

We'll help you get the most out of it.

CompuServe puts a world of information, communications, and entertainment at your fingertips.

CompuServe is the versatile, easy to use interactive videotex service designed especially for the personal computer user. It's dynamic, growing and changing daily to satisfy its subscribers' needs. It's an industry leader, created and managed by the same communications professionals who provide business information and network services to over one fourth of the FORTUNE 500 companies.

From current events to current assets, CompuServe offers a wealth of useful, profitable or just plain interesting information. Electronic magazines and national news wires plus worldwide weather, current movie reviews, electronic banking and shop at home services, and some of the most sophisticated financial information available are all offered to current subscribers.

From words to music. CompuServe offers a communications network that gives special interest groups from hardware enthusiasts to computer composers a chance to get together. There's a bulletin board for selling, swapping, and personal notices and a CB simulator for real-time communications between subscribers. There's electronic mail, the fastest, surest, way to communicate with other users across the street or across the country, plus file retention and editing, and lots, lots more.

Fun and games are expected whenever computer users interact, and CompuServe has the best. Games you can play alone or with other CompuServe subscribers anywhere in the country. Classic puzzlers, sports and adventure games, and fantastic space games featuring MegaWars, the "ultimate computer conflict."

But, that's just the tip of the chip. CompuServe offers a menu of thousands of items that make subscribing educational, fun and sometimes downright profitable. If you'd like to know more about CompuServe, call toll free, 800-848-8990 to receive an illustrated guide to the CompuServe Information Service. A videotex service for you no matter which computer you own.

CompuServe

P.O. Box 20212
5000 Arlington Centre Blvd., Columbus, Ohio 43220

800-848-8990

In Ohio call 614-457-8650

An H&R Block Company

CIRCLE 144 ON READER SERVICE CARD

Automatalk

Suzan D. Prince

Anybody can string together a single circuit card, drive motor and serial-to-parallel interface to create a Basic-programmable Terrapin Turtle, or use an RF-controller to construct Wires the Robot Cat. But will such relatively inexpensive (less than $1,000) "mechanimals" ever run much more than mazes, or accomplish anything really practical—say, clean out the garage or take your kid for a haircut?

Sadly, no. Although experts like Stan Veit, co-owner of the Robot Mart in New York, believe demand for the home personal robot is now where demand for the home computer was less than a decade ago, there is much discussion—and disagreement—over how fast and how far robots will be developed to be everyday tools.

Prohibitive costs and elusive technology cause some observers to put the day of practical domestic applications at least five, but more likely 10 and even 20 years away.

"The future is about 10 years down the road," ventures Jerry Hamlin, president of ComRo, Inc., New York. "The home market won't break until robots are as cheap as Apples or TRS-80s. But technology isn't that far on the learning curve yet."

Hamlin, a former film editor who became fascinated with robots after viewing such sci-fi classics as *Day the Earth Stood Still* and *Star Wars,* built ComRo I, a combination radio-controlled, micro-based system distributed through Neiman-Marcus for $17,500. Only two were sold in 1981, one each to the Mitsubishi Corp. of Japan and to the head of a Saudi-Arabian importing concern. In addition to its SIM-I single card computer (Simutek Computer Products, Tucson, AZ), ComRo I has a built-in vacuum cleaner, cigarette lighter, spotlight, radio, stereo and TV, and for good measure, a magazine rack.

But for all its fancy good looks, Hamlin notes, ComRo is almost completely helpless without a human, although a few functions such as plant watering and floor sweeping can be programmed from the circuit board.

RF-controlled Wires the Robot Cat, Hamlin's other contraption which sells through retail stores for $650, is by contrast a starkly simple design. "Wires was made essentially from objects found around the house—a gas can here, vacuum cleaner wheels there," he explained. Both devices are more entertaining than useful, the inventor admits.

Hamlin, along with Charles Lecht, president of Advanced Computer Techniques Corp., New York and Ron Wiener, 17-year old Bronx High School of Science senior and president of National Cybernetics, Inc., recently appeared on *Midday,* a local talk show, to discuss robots and computers in society. Lecht, software consultant and author of a book, "Waves of Change," told the studio audience (mostly micro-owning elementary and high school students) that someday, "a fantastic range of artificial intelligence will be available" to the average consumer.

Showbots

Like Hamlin, however, Lecht agreed that the first widespread use would arrive in the form of fancy "showbots" such as ComRo I. These teleoperated low-intelligence beings often seen at trade shows and amusement centers are almost totally dependent on humans for mobility and rechargeability.

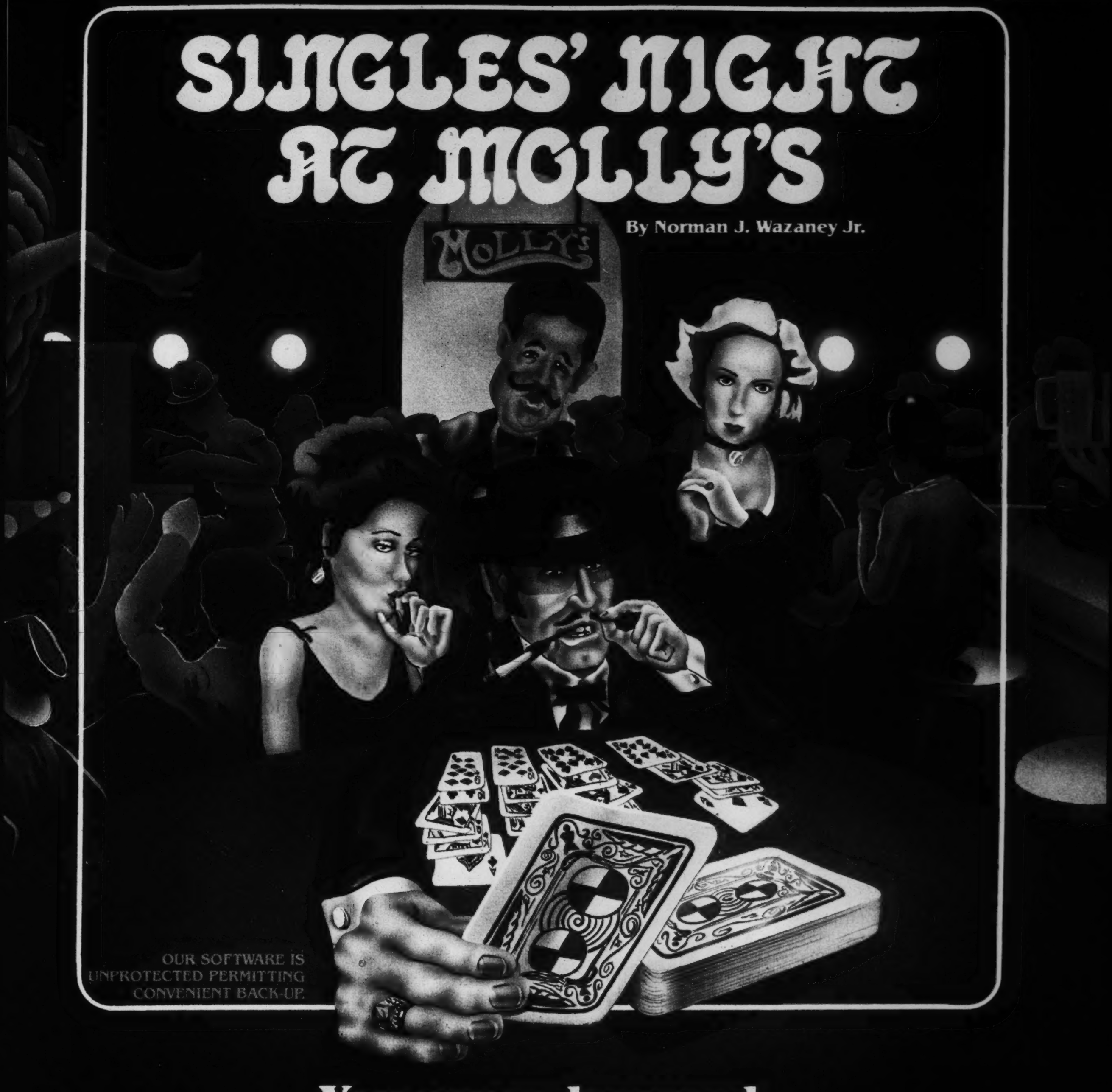
"Will the average family buy robots? Yes, I believe so, but they will be con-

---

Suzan D. Prince, 21 Spruce St., Great Neck, NY 11021.

SINGLES' NIGHT AT MOLLY'S

By Norman J. Wazaney Jr.


MOLLY'S
OUR SOFTWARE IS UNPROTECTED PERMITTING CONVENIENT BACK-UP.

You never dreamed Solitaire could be so fascinating.

Solitaire in a saloon can be fun but it's better on your Apple*. Fair warning: if you get hooked on Solitaire, beware of this game! "Singles' Night at Molly's" is actually two basic solitaire card games with several variations permitting you to use the skill level and strategy you enjoy most. Play alone or against other players, where a rating system declares the winner. Features High Resolution color graphics, full user documentation and various scoring potentials.

There are hours, days, even years of pleasure to be derived from this intriguing game. Available now for only $29.95 at computer stores.

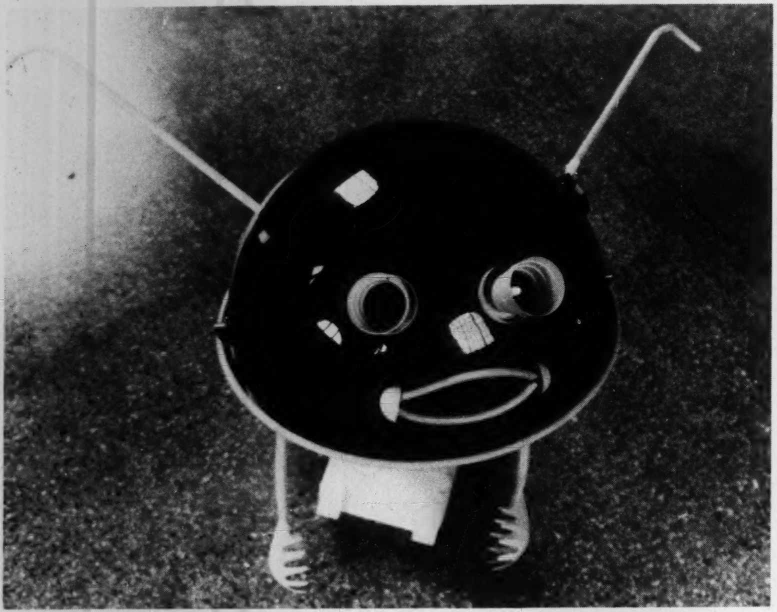
To order by phone, call 800-526-9042 and use your Visa or MasterCard. All shipments made the same day in which orders are received. To order by mail, add $1 for shipping charges and send your check to:
Soft Images, 200 Route 17, Mahwah, NJ 07430.

"Singles' Night" runs on 48K Apple II, Applesoft in ROM. 3.3 DOS/One Disk Drive

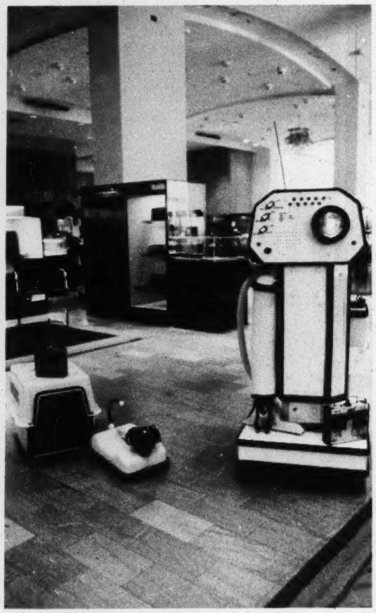
CIRCLE 316 ON READER SERVICE CARD

*Apple is a registered trademark of Apple Computer Co.

Soft images
DIVISION OF DECISION SYSTEMS INC



"It's handy having spaghetti spoons for hands," says ComRo's Bubble-Bot.



NASA? No, Neiman Marcus, retailing ComRo I *and* Wiros.

sidered household pets," says Lecht. Adds Hamlin, "Like video games, these devices will become popular for their novelty and recreational value before their functional value is discovered. The role of the domestic robot is not yet clearly defined."

But Wiener, who plans to study at Carnegie-Mellon University's well-regarded Robotics Institute in Pittsburgh this fall, believes any future domestic plan must include telecomputing capability.

"My own prototype designs already incorporate telecomputing," he notes. "Ideally, a radio-controlled robot will be linked to a stationary micro based somewhere in the house. The thinking part—an Apple or whatever—remains separate from the doing part, with the robot processing and executing instructions from the remote terminal wherever and whenever it is told."

The machines Wiener presents to venture capitalists and interested engineers bear little resemblance to what the public generally imagines robots should look like.

"My designs have no nice plastic outer shells," he says. "They are too expensive and really unnecessary to the performance of the robot."

Ironically, among the obstacles to creating a mass market, functioning home robot is man's insistence on making the machine in his own image. The notion of robot (from the Czechoslovak word "robotta" meaning "forced labor") goes back to the 16th century. By the 1700s, the French were amusing themselves with upright musical automatons which could also write letters. Then in 1921 Karel Capek, a Czech playwright, first coined the term in his work *R.U.R.*, describing a grim futuristic fantasy in which mechanical robots turned on their human employers and eventually exterminated them. Ever since, most lay impressions have been formed from science fiction films in which androids do everything humans can do, and more.

A serious roboticist can actually impede his own progress by trying to imitate well developed human characteristics.

In reality, a serious roboticist can actually impede his own progress by trying to imitate well developed human characteristics. For example, although it is easy for a human hand (and brain) to pick an object from a boxful of items, a mechanical arm has tremendous difficulty distinguishing anything that is not isolated or on a flat surface. There is simply too much information to process at once, says Thomas O. Binford, a Stanford University researcher in artificial intelligence. "It is a problem essentially of making a map of the world inside a computer."

The Problem Of Touch

Another problem area, the sense of touch, is vividly illustrated in an event occurring shortly after the Three Mile Island nuclear plant accident in 1979. Personnel could not reach the coolant valve because of radioactivity, so a robot named Herman was flown in from Oak Ridge National Laboratory. Herman quickly became useless, however, because he lacked the maneuverability to get to the valve, and his touch was so crude that officials feared it would twist the valve completely off.

Entrepreneurs and scientists agree that along with touch, maneuverability through vision, and the ability to reason and act on the environment will be the toughest problems to overcome in producing a polished thinker/doer. Progress will take years; in each case, either the technology needed for a robot to wash windows without breaking them, grip a wine glass without shattering it, or see well enough to distinguish a plate glass window from a concrete wall is still either unavailable or exorbitantly expensive.

A mechanical arm sold by Microbot Inc. of Menlo Park, CA, for example, can move at the shoulder, elbow, wrist, and hand, using cables and pulleys

BLACK JACK STRATEGY

By: Norman J. Wazaney Jr.

Play Like A Winner!

This complete system provides simple, step-by-step instructions to help you raise your level of play regardless of your present skill. Features include a SIMULATOR for testing betting and playing strategies, a TUTOR to teach the strategies and a GAME with all the options available at the casinos. Another outstanding feature is a Strategy Table Compiler for ease of entering and visualizing your playing and betting strategies.

The system is able to simulate millions of hands and provides better insight into computing odds and house percentages. You may be surprised to discover how many of your pet theories are less than accurate.

Black Jack Strategy runs on 48K Apple II, Applesoft in ROM.
3.3 DOS/One Disk Drive Printer Optional

OUR SOFTWARE IS UNPROTECTED PERMITTING CONVENIENT BACK-UP.

The comprehensive documentation is packaged in a handsome, easel-backed binder. Available now for only $69.95.

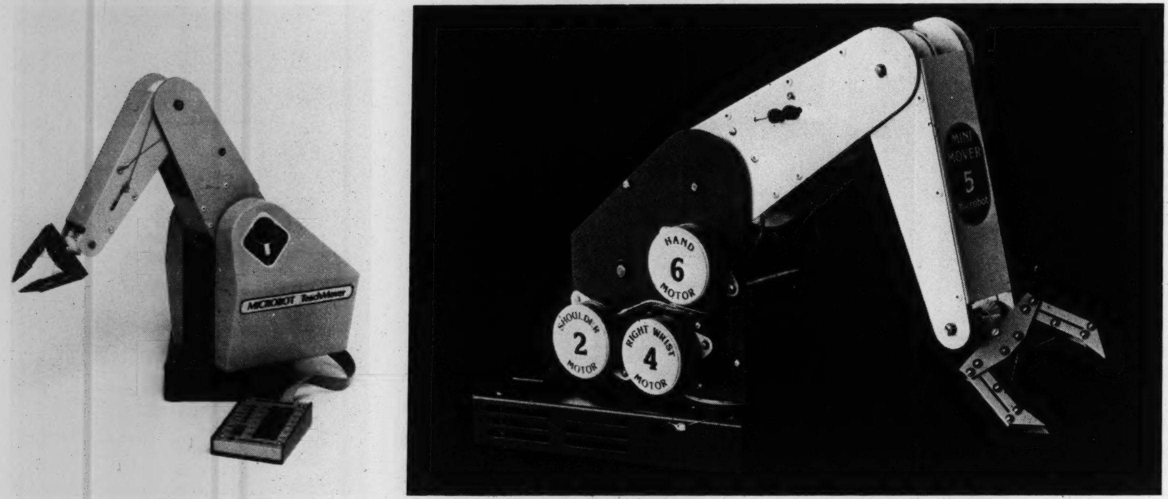
Since winning is always more fun than losing, be fair to yourself and get Black Jack Strategy before your next visit to the casino (where $69.95 will not go very far).

To order by phone, call 800-526-9042 and use your Visa or MasterCard. All shipments made the same day in which orders are received. To order by mail, add $1 for shipping charges and send your check to:

Soft images
DIVISION OF DECISION SYSTEMS INC.
200 Route 17, Mahwah, N.J. 07430.

CIRCLE 317 ON READER SERVICE CARD

*Apple II and Applesoft are registered trademarks of Apple Computer Co.



Microbot's TeachMover *and* Mini Mover: *not yet ready for the hobbyist at $212 per ounce of lift.*

under control of a personal computer. What it can't do, however, is lift more than half a pound—hardly a bargain peripheral at $1700. Applied Concepts, Inc. of Garland, TX, which developed the chess playing robot, Boris Handroid, nixed the game from the market recently because the technologies even for getting a fixed arm to move a fixed chess piece to a fixed point on the board had too many bugs. And Novag of Los Angeles, which again displayed its pre-production Robot Adversary chess system at the 1982 Summer Consumer Electronics Show in Chicago, expects the $1400 unit to be purchased mostly by "people looking for a conversation piece for their living rooms," a representative said.

Vision

Producing an efficient, inexpensive vision system is another hardship, as two Rhode Island professors discovered last year when they developed robots requiring two TV cameras each plus a mechanical arm to selectively pick up objects thrown randomly into a bin. Estimated cost for a single system is $75,000.

Most visual robots undergoing tests in today's factories are limited because they see a flat, two-dimensional world. To give robots a sense of depth, scientists in the research lab are building eyes that see in three dimensions.

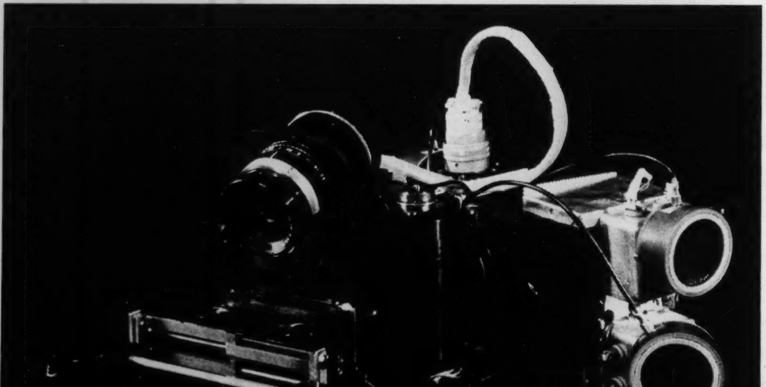
One such robot sits on a table in a darkened room at the National Bureau of Standards in Washington, DC. With a light shining from its fingertips and a television camera mounted atop its wrist, this mechanical arm scans nearby objects such as metallic cubes and cylinders. The camera transmits the image of any object illuminated by the light to a computer under the table. Applying simple geometry, the computer calculates the shape and location of the object, and then tells the robot arm how to grip it and where to move it.

But robots that use light beams can see only where the light shines and for only a few feet. If a machine is to navigate through a cluttered home or office, it must perceive complex, three-dimensional panoramas in stereo, using two eyes as people do. Since duplicating human visual perception and recognition is far beyond present capability, scientists are working on less complex systems that mimic human vision.

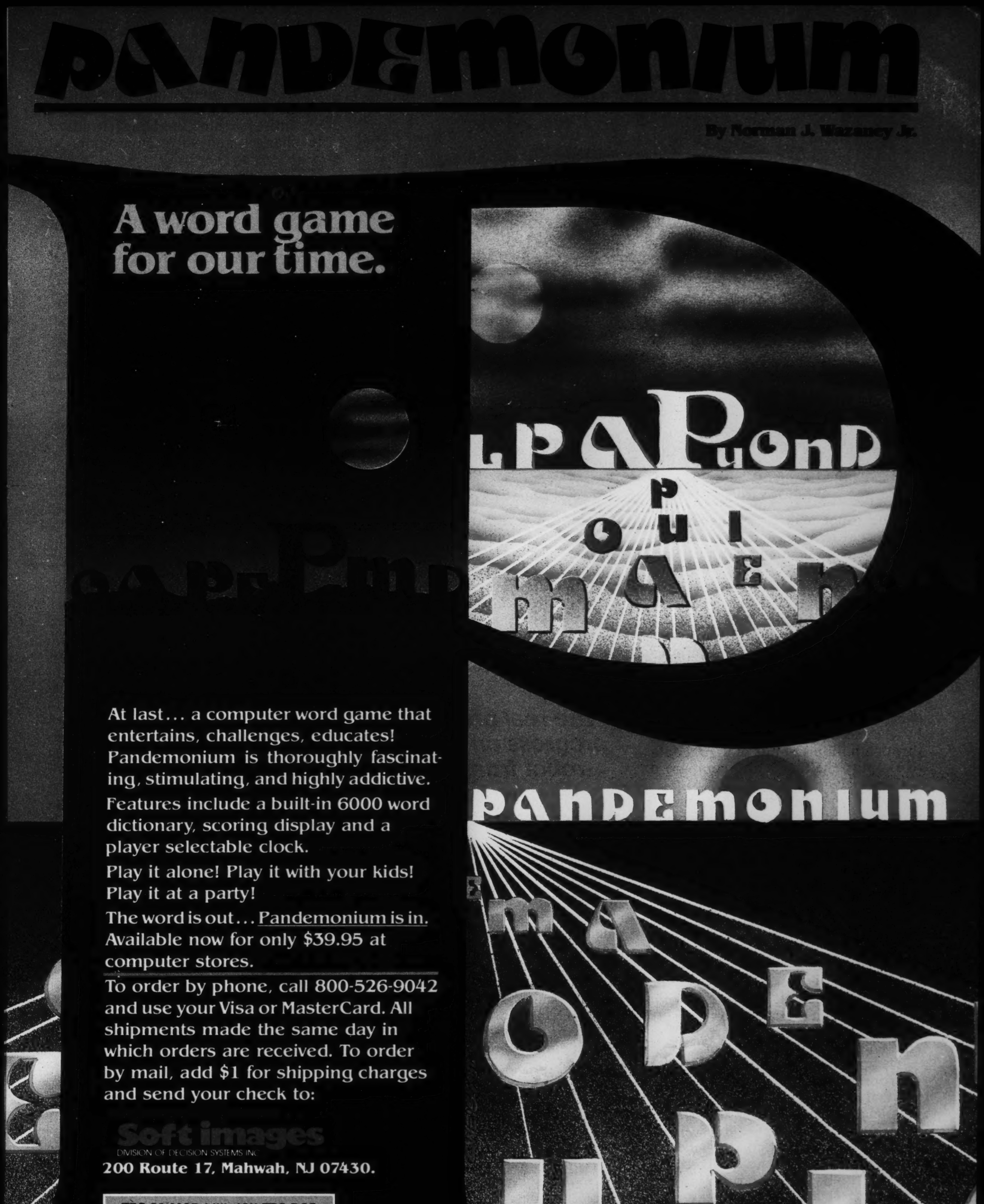
Like the two Rhode Island scholars, Stanford's Binford is building a robot that uses two video cameras to see in stereo. The computer brain reduces the resulting image to a few crucial lines indicating the most important edges and curves.

For example, to recognize an airplane, the camera eye of the robot transmits a picture of the plane to a computer, which simplifies the image to its basic shape, then to a few essential lines, and finally to the most critical points. To enable the robot to recognize such pictures easily, Binford is building a "world model," an electronic memory that will eventually contain enough information to identify most physical objects or landscapes. His goal is to construct abstract models of common objects, starting with those in his laboratory, using a single building block—a three-dimensional cone-shaped image that can be represented digitally in the computers memory and output to a CRT screen.

Similarly, inventor Jerrold Gleason, featured on a recent episode of the ABC-TV science show *Omni*, created a seeing robot that recognizes and stores images and shapes.



Machines that can see; the first tentative steps in a mammoth undertaking. (*From the National Bureau of Standards.*)


PANDEMONIUM
By Norman J. Wazaney Jr.
A word game for our time.
LPAPuonD
PANDEMONIUM

At last... a computer word game that entertains, challenges, educates! Pandemonium is thoroughly fascinating, stimulating, and highly addictive.

Features include a built-in 6000 word dictionary, scoring display and a player selectable clock.

Play it alone! Play it with your kids! Play it at a party!

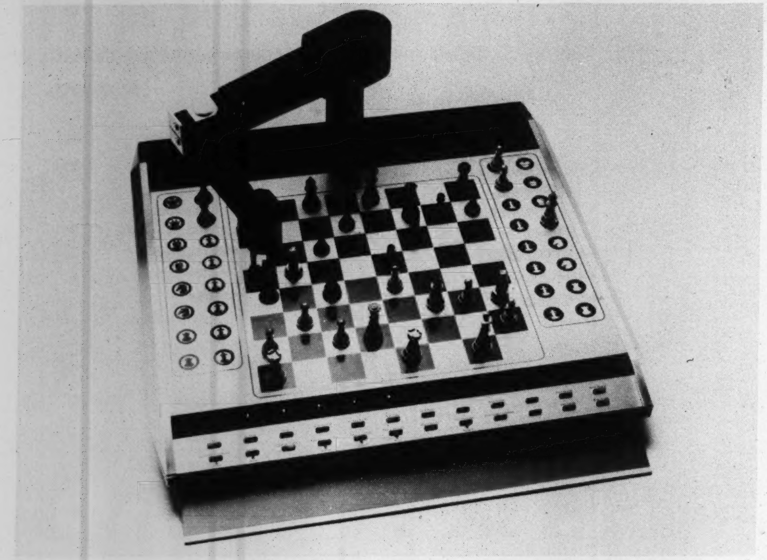
The word is out... Pandemonium is in. Available now for only $39.95 at computer stores.

To order by phone, call 800-526-9042 and use your Visa or MasterCard. All shipments made the same day in which orders are received. To order by mail, add $1 for shipping charges and send your check to:

Soft images
DIVISION OF DECISION SYSTEMS INC
200 Route 17, Mahwah, NJ 07430.

TRS-80 MOD I/III 48K TRS-DOS
TRS-80™ Radio Shack/Tandy Corp.

OUR SOFTWARE IS UNPROTECTED PERMITTING CONVENIENT BACK-UP.
CIRCLE 318 ON READER SERVICE CARD



Novag's Robot Adversary: $1400 conversation piece?

"The robot makes a digital record of a visual image, such as a wrench, then keeps it in memory until it is recalled upon sight," Gleason explained. "This development is significant because the robot will not stumble as in the past, but will adjust to the shape the same way people do."

But both Gleason's and Binford's seeing robots are painfully slow, sometimes taking two or three minutes to recall a simple geometric shape like a cube or a square. The delay is caused by the need of the machine to sift through millions of bits of digital data to simplify the image and compare it with models in memory.

To improve speed and recognition, researchers at Massachusetts Institute of Technology are attempting to coordinate both sight and touch by building robotic skin made of thin sheets of rubber lined with wire. The sheets, stack one on top of the other, line the robot's hand. The top layer receives a steady flow of electric current from a power source on the robot. When the hand or fingers touch something, the sheets press together and the wires make contact, allowing current to flow through low layers. As pressure increases, additional wires come into contact and more current flows.

Thus, a robot hand connected to a microprocessor that measures voltage will feel the shape of an object much as people do with their fingers. Unlike other artificial skin, the MIT version forms an image of what it touches. A robot touching a keyhole will see the keyhole in its computer brain, and that same image could appear on a screen.

The Future Is In Software

The real promise for progress on the home robot front lies, as always, in software development. Observers believe that the ability of the computer to absorb, compare, and alter data from given instructions will more than compensate for its mechanical clumsiness. To endow robots with enough artificial intelligence to beat an army (or at least cook a meal), scientists are counting on the development of VSLI (Very Large Scale Integrated) circuits. Several years on the drawing board and now used in limited office and factory applications, these circuit systems should be ready for consumers within the decade and will work at least one thousand times as fast and hold one thousand times as much information as today's best microprocessors.

The real promise for progress on the home robot front lies, as always, in software development.

Then, says Raj Reddy, director of the Robotics Institute at Carnegie-Mellon, each robot eye, ear, and hand will have its own tiny but powerful microprocessor to sift through billions of visual points, analyze hundreds of voices or determine the pressure on each finger and joint. The most important data will be sent to the central computer, the size of a transistor radio, which will coordinate the entire machine, enabling it to adapt to changes and solve environmental problems as they arise.

The heart of such precise intelligence is a world of program steps created by designers who realize that most real world problems cannot be squeezed into a rigid, numbers-oriented form. Thus, instead of following a carefully structured sequence of mathematical steps that must be carried out in a predetermined sequence, i.e.:

```
20 IF KY=8  THEN 1600
30 IF KY=13 THEN 1700 . . .
```

artificial intelligence programs process ideas and knowledge, rather than numbers, using several methods. Some researchers use collections of if-then statements, i.e.:

```
20 If an animal has a trunks
30 Then it is not a dog.
```

Other researchers are building pyramid-like "networks" of facts, which tell the computer how various pieces of information are related. With such networks, the computer "knows" that "all dogs and elephants have four legs, but only elephants have trunks."

AI programs then manipulate this knowledge, just as humans carry out a line of reasoning. Rather than follow precise "how-to" instructions from human operators, AI programs sort through the knowledge stored in memory and determine their *own* sequence of steps—whatever solves the problem. The programmer must provide only general guidelines for searching.

For example, when given data about a problem—such as an obstacle course—the AI program looks for the rules that apply. By executing a rule, the computer creates additional data about the problem at hand. Then, it begins to search for another rule that applies to the new set of data. The computer repeats this operation until it reaches a final conclusion. The following is an over simplified illustration:

Program Rule 1: The distance from the kitchen stove to the dining room table is 10 feet; a doorway is located halfway between.

Computer Rule 1: Create a path from stove to table using doorway.

Computer Rule 2: Move north five feet to reach doorway; move north five feet again to reach table.

Using AI techniques, researchers are making steady progress toward computers that can instantly pick key information out of the flood of sensory data—like picking needles out of a

At last... a better way to find that article on computing!

An indexing service to locate source material in specific subject areas.

LAMP is a bi-monthly index to approximately 100 computer publications. An outstanding feature is the Subject Index, cross-referenced to provide the most comprehensive listing and ease of retrieval. All articles are read for subject content and then listed with as many cross references as required to retrieve the article.

An Author Index lists individual names as well as each contributor in jointly written articles. Another section is the Review Index which covers book reviews, hardware, software and educational courseware. It lists the source of the review and translates the written review into a One-Star to Five-Star rating.

LAMP eliminates the hit or miss method of finding articles of interest to you. Each bi-monthly issue contains approximately 200 pages.

A year-end issue is cumulative and includes the information from the previous 5 issues. Send for your subscription today.

BONUS FOR CHARTER SUBSCRIBERS
Subscribe now for the inaugural issue to be published in January 1983 and receive the LAMP pilot program which indexed periodicals from June through October, 1982. In effect, 5 months of LAMP free for ordering now.

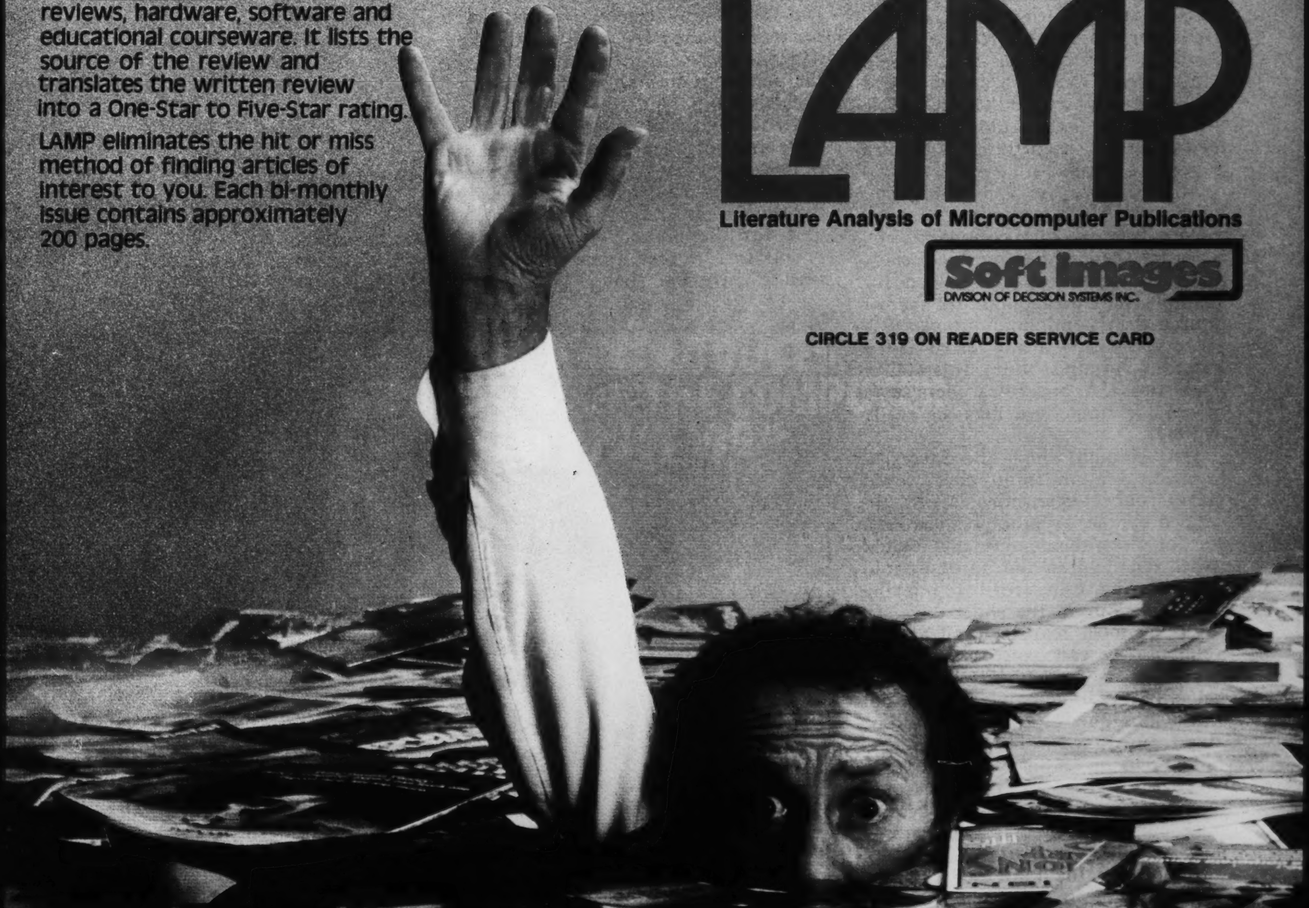
To order by phone, call 800-526-9042 and use your Visa or MasterCard.
To order by mail, send your check for $69.95 to Soft Images, 200 Route 17, Mahwah, N.J. 07430.

LAMP

Literature Analysis of Microcomputer Publications

Soft Images
DIVISION OF DECISION SYSTEMS INC.

CIRCLE 319 ON READER SERVICE CARD



haystack. Several companies now developing AI vision systems, for example, will permit robots to ignore unimportant information supplied by sensors.

To make AI programs even smarter, Hans J. Berliner, a professor at Carnegie-Mellon, believes that one approach lies in what he terms "fuzziness"—programming the computer so "you rely less on binary decision-making; you don't always insist that something is either day or night before you deal with it." The reason, he explains, is that "when you make a binary decision, you cannot afford to be wrong, because you are then 100% wrong." On the other hand, programming the computer to deal with a spectrum of situations is "much more forgiving."

Robots And The Handicapped

While AI programming and VLSI circuits should help crack the mass marketplace within a decade, the handicapped may benefit from robot technology as early as next year. Researchers at Stanford University are currently exploring the first serious use of general purpose robots for the disabled, a mechanical arm to aid paraplegics. The arm, a modified industrial robot, would sit on a table or wheelchair and could be used to feed a person, fetch things, and turn pages of a book.

Additionally, the arm recognizes voice commands telling it how to move, verifies the commands by repeating them with electronic speech, and then acts accordingly. It can, for example, pick up a phone receiver or pour a drink and hold the glass. A prototype is now being tested at the Veterans Administration Hospital in Palo Alto, CA, and researchers say a model for home use may be ready in 1983.

Jerry Hamlin, who is also interested in medical applications that would make robots extensions of handicapped people, eventually envisions a sort of electronic nanny that would watch the children and do household tasks ranging from security to relaying messages. But in the short term, he says, the most realistic (and affordable) use we can expect from home robots is as intelligent household helpers, i.e., a basic standardized robot with a manipulator arm that would be able to use standardized attachments ranging from mops for floors to squeegees for doing windows. It would have a television camera for eyes, a microcomputer for brains, something akin to the rubber skin being developed in the labs today, and a "feeding unit" for self-recharging.

Along these lines, the inventor predicts a modular construction, perhaps in three parts, with the top parts able to shift themselves onto a lawn mower or floor-scrubbing unit to do specific tasks. Thus special purpose robots might be the first used in the home, incorporated into appliances, just as microprocessors entered the home in microwave ovens. A washing machine could have an arm to unload clothes. A lawn mower with intelligence could work unattended.

Hamlin envisions a sort of electronic nanny that would watch the children and do household tasks.

For now, entrepreneurs like Hamlin and Wiener will keep on cannibalizing electronic hobby kits and scavenging rummage sales and flea markets for the perfect combination of parts and programming.

"It's a matter of bringing the hardware and software together to create more advanced systems," Wiener says. "But the real challenge lies in harnessing this power and making it marketable for the masses. When we do, robots will become a major factor in raising people's living standards." □

For further information:

Advanced Computer
Techniques Corp.
437 Madison Ave.
New York, NY 10022
(212) 421-4688

ComRo Inc.
570 Park Ave.
New York, NY 10021
(212) 288-0554

National Cybernetics, Inc.
105-15 66th Rd.
Forest Hills, NY 11375
(212) 275-2636

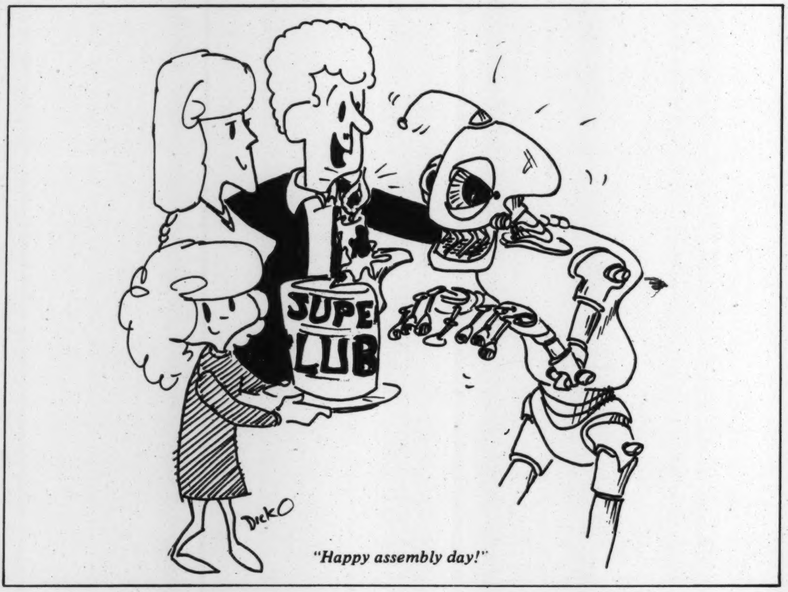
Programmable Automation Dept.
National Bureau of Standards
Washington, DC 20234
(301) 921-1000

Robot Institute of America
One SME Dr.
P.O. Box 930
Dearborn, MI 48128
(313) 271-1500
(National trade association for the Society of Manufacturing Engineers)

Robotics Institute
Carnegie-Mellon University
Pittsburgh, PA 15213
(412) 622-3131

Robot Mart
19 West 34th St.
New York, NY 10001
(212) 695-5108
(Catalog and newsletter, $3)

Terrapin, Inc.
678 Massachusetts Ave., #205
Cambridge, MA 02139
(617) 492-8816



"Happy assembly day!"

THE POWER IS WITHIN YOUR REACH.

TIMEX sinclair 1000
SHIFT
ENTER
SPACE

TIMEX INTRODUCES THE POWER OF THE COMPUTER FOR JUST $99.95*

TIMEX sinclair 1000

Now Timex brings you a real computer at an unreal price with these sophisticated features:

- Unique "one-touch" entry of key words like RUN, LIST, PRINT eliminates tiresome typing.
- Full range of mathematical and scientific functions accurate to nine and a half decimal places.
- Graph drawing and animated display facilities.
- Multidimensional string and numerical arrays.
- 2K RAM expandable to 16K with the optional accessory RAM module.
- Cassette LOAD and SAVE with named programs.
- Advanced 4-chip design: microprocessor, ROM, RAM, plus Master Chip.
- Ability to imbed Z80A machine code within BASIC programs.
- Full data address and control busses access provided.
- Powerful data string-slicing mechanism.

The power of the computer is within your reach today. Visit your local retailer or call our toll-free number 1-800-248-4639 for the Timex computer dealer nearest you.

TIMEX COMPUTERS

THE POWER IS WITHIN YOUR REACH

*Suggested retail price

© Timex Computer Corporation, 1982

CIRCLE 356 ON READER SERVICE CARD

"TI's Home Computer. This is the one."

A lot of computers offer a lot. Only one in its price range offers the most. The TI Home Computer.

Better to begin with. Anyone can start right away with our Solid State Software™ Command Cartridges. Dozens of programs are available in home management, education and entertainment.

Easy to expand. Our Peripheral Expansion System gives you plug-in cards for memory expansion, P-Code capabilities, a disk drive controller and the RS232 Interface. You can also add a modem, speech synthesizer, disk drive and 80 column dot matrix printer.

Programming flexibility. TI BASIC is built into the Home Computer. But it can also handle TI Extended BASIC, UCSD Pascal* Version IV.0, TI LOGO II, TMS 9900 Assembly Language and TI PILOT. Programs can be stored in the optional Mini Memory Command Cartridge.

High-Tech specs. 16-bit microprocessor, 16K bytes RAM (expandable to 52K). 26K bytes internal ROM, up to 30K bytes external ROM. 3 simultaneous tones from 110 HZ to 40,000 HZ. High resolution video. U. & l.c. Single line overlay for 2nd function. Control & function keys. 16 color graphics with 4 modes & sprites.

Sound impressive? Compare a TI Home Computer with the competition and really be impressed. You won't even need a computer to tell you this is the one.

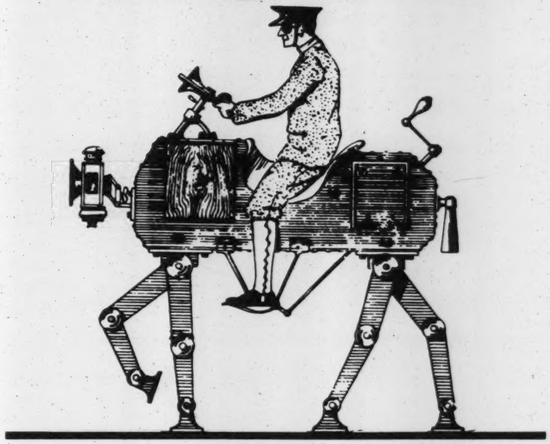
TEXAS INSTRUMENTS

© 1982 Texas Instruments

*UCSD Pascal is a trademark of the Regents of the University of California

CIRCLE 354 ON READER SERVICE CARD

Inventing the Future



L. Pearce Williams

Let me begin with a cautionary preface. As an historian, I know that history reveals so many unexpected turns that only a madman (or a futurologist) would venture to predict the future. It is only hindsight that enables us to discover the important elements that led to this or that event. A few illustrations will make my point.

Necessity, so the commonplace goes, is the mother of invention. The prognosticator glibly argues that by defining the current needs of society and by determining the state of current technology, future technology can be predicted. Sometimes, of course, such a strategy works. But it often does not.

Take, for example, the stirrup. The horse was domesticated around 2500 B.C. and one would imagine that soon thereafter, some corpulent or clumsy horseman would have recognized the practicality of slinging a loop beneath his saddle to facilitate mounting, dismounting, and riding. But the stirrup was invented around A.D. 500, some 3000 years after it was needed. That's a long gestation period.

The stirrup also provides another moral: it is nearly impossible to predict the social impact of a new technology. Prior to the stirrup, cavalry was merely one aspect of the military leader's might. The invention of the stirrup placed the cavalry in a new and dominant position. The stirrup permitted the rider to make a slashing swipe with a sword and, more importantly, permitted the couched lance to be used with devastating results. From Charles Martel's first use of heavy cavalry against Islam in the early eighth century, until the burghers of Nancy in France turned back the chivalrous Duke of Burgundy in the late fifteenth century, the mounted knight carried all before him.

Reprinted from Executive, *Volume 7, Number 2. © 1982 Cornell University Graduate School of Business and Public Administration.*

The social impact of the stirrup is worth noting. To learn to fight on horseback required years and years of training, so the mounted knight became a new elite which used its military power to secure some share on the governance of the state. The mounted knight was also civilized through chivalry into an aristocratic caste whose ideals of honor, glory, and valor permeated European society down to the twentieth century. It is, of course, an exaggeration to suggest that the culture of the Middle Ages was the result of the stirrup, but at least one foot of medieval civilization was firmly planted in it.

The ripple effect of an invention further complicates the art of prediction. It may be possible to predict the future course of a specific line of technological development, but it is absolutely impossible to foresee what the side-effects may be. Who would have dreamed that one result of James Watt's separate steam condenser—making relatively efficient steam power available—would be the machine gun which has killed more people than any weapon in history? Yet the line of descent is both clear and simple. Watt's engine led men to dream of pressure steam; pressure steam required new steels and new machine tools to improve the fit between piston and cylinder. A machine gun is nothing but a pressure steam engine with removable piston (barrel and bullet), machined so closely that the piston is almost instantaneously replaceable as the "steam" or exploding gases from gunpowder expel the piston-bullet. The technology required to build pressure steam engines is precisely the technology required to build machine guns.

Such technological developments take place within a most complicated and intricate society whose casual dynamics are veiled from view. We cannot safely predict the main course of political events for the next twenty years, so the possibility of predicting technological paths that are determined by these political events becomes doubly hazardous.

So much, then, for the pitfalls of prediction. To some extent, however, the future is clear. By the year 2000, solar energy will be efficiently produced—if efficiency is defined in terms of the escalating price of oil. Almost a reality today, nuclear fusion should be beyond the pilot plant stage by 2000.

But these breakthroughs—important as they are—pale before the consequences of the computer revolution. Since 1950, the advance of science has been marked by two trends that can be summed up in the words, "information" and "discrimination." The birth of information theory after World War II paved the way for the invention and development of the computer. And since the appearance of the first computer, the dialectical interplay of physics, mathematics, and computer technology has created a new world.

In December 1980, *The New York Times* magazine featured the computer revolution and discussed the prospects for true artificial intelligence. The same month, *Time* magazine wrote of the replacement of human beings by robots for most dull and routine work. Such breakthroughs depend on a minute silicon chip able to store enormous amounts of information in a very small space. (*The New York Times* illustrated this graphically by picturing a chip, smaller than the eye of a needle, that contained 64,000 separate pieces of information.)

Information theory, however, has not been confined to computers and physics. It has most dramatically revolutionized the science of living matter. DNA and the genetic code are, after all, nothing more than biological counterparts to the silicon chip and the information it contains. These molecular chips are not read on a printout or screen, but through the intermediary of other molecules. Manipulation of enzymes permits molecular geneticists to take DNA chains apart, examine the fragments, read the separate sentences of the genetic code, and finally put the whole back together with instructions inserted almost at will by the experimenter. This ability of biochemists to discriminate between substances on the molecular level is the result of new instrument technology and new understanding of the chemistry of organic molecules.

The combination of information theory and computers, with the ability to read and manipulate the genetic code, opens up new possibilities that may ultimately revolutionize the human condition. Since futurology permits speculation, let me now try to envision what may soon be a new and markedly different world.

We no longer need personal contacts to spread ideas, nor need we tap human energies to get things done.

One of the prospects that both *The New York Times* and *Time* held out was the end of dull and routine work. Even now, many operations in the mass production of automobiles are performed by computer-controlled robots who can work more efficiently, tirelessly, and accurately than humans. The kinds of work for which time and motion studies were originally devised will undoubtedly soon be performed by machines. Except in the most backward sections of the country, manual labor, too, will have vanished. Backhoes today have made ditch diggers obsolete; there is no reason why backhoes cannot be equipped with small computers to eliminate their human operators. Unpleasant labor, too, should be relegated to the ashbin of history. The *Times* article singled out garbage collection as a candidate for early computerization, no doubt because the author spent some time in New York City, where efficient garbage collection remains a Utopian dream. But these effects are all petty—mere continuations of the long trend of substituting mechanical power for human muscle. The continued development of computer technology will have greater impact.

The most dramatic possibility is the elimination of the city as an essential part of our society. Cities were originally formed in Mesopotamia because they permitted the rapid transmission of ideas and allowed cooperative social effort. Massive irrigation and drainage works required the concentration of large numbers of human beings. It was the city that permitted civilization to emerge because civilization depended upon the ability to translate ideas for great projects into the works themselves as rapidly as possible. The modern city serves much the same function. Cities, today, are industrial, commercial, or transportation centers that rely upon rapid interaction between human beings. The arts and sciences have thrived in an urban setting precisely because ideas are in the air and the social interaction made possible by massed population serves to stimulate creativity.

Computers can now dispense with all that the city has to offer. We no longer need personal contacts to spread ideas, nor need we tap human energies to get things done. The computer revolution removes, then, the raison d'etre of the city itself. The computer printout, recorded as a permanent memory, will replace casual conversation. Made up of people from all over the globe who need not suffer jet lag, television conferences will take the place of costly meetings. Instead, with records and materials at their fingertips, executives will be able to devise strategies and make decisions. This trend has already taken hold: executive offices have been moved out of cities and into the suburbs. The next logical step will be to eliminate the executive office and conduct business from the home. No real purpose is served by having people leave their houses, artificially uniformed and psychologically armored for combat to "work" elsewhere. The business office of the year 2000 will be housed in the relaxed atmosphere of the home.

Perhaps better described as a living module, the house itself will be serviced by computer technology. All housework, dull and routine as it is, can now be done by robots controlled by a central "housekeeper" computer. Cooking, dishwashing, cleaning and even bed-making, the traditional tasks that have hitherto driven the ambitious woman from the house, will soon be relegated to mechanical servants. Even the chore of shopping should disappear. The computer can easily keep an inventory of foodstuffs and other necessities and place orders with the computer at the nearest super-warehouse. Orders

PERSONNEL
ELI STEIN

"Well...so you're a mimeograph machine operator. What's a mimeograph?"

WE'VE MOVED TO THE STATE OF WASHINGTON!

And, we're celebrating with Special Discount Prices!

IMPORTANT: You must mention this ad or send it with order to receive advertised price!

OVER 1,000 ITEMS IN STOCK

STOCK ITEMS SHIPPED SAME DAY

MOVING SALE!

on apple® software

micro mountain

Great News for Californians!

ORDER TOLL FREE (800) 854-5649

AND... SAVE ADDITIONAL 6% (NO SALES TAX)

This is the same Watts number the rest of the world has been using for ages. If you live in Washington State or need customer assistance call direct — **(206) 483-2000.**

SILICON VALLEY SYSTEMS	**Word Handler**	$149.50
KENSINGTON MICROWARE	**System Saver**	$65.50
PROMETHEUS	**16K RAM Card**	$69.50
COMPUTER APPLICATIONS	**Nibbles Away**	$49.50
PENGUIN	**Complete Graphics System II**	$54.50
D.C. HAYES SOFTWARE	**Micro Modem II**	$289.50
BRODERBUND	**Arcade Machine**	$35.50
ONLINE SYSTEMS	**Sreen Writer II**	$95.50
EDU-WARE	**Prisoner II**	$20.50
A2D	**2001 Joystick**	$35.50
VISICORP	**Visicalc 3.3**	$195.50

ASK FOR FREE CATALOG

DEDUCT 3% if payment accompanies order. ADD $2.00 (surface) SHIPPING & HANDLING. INCLUDE AN ADDITIONAL $3.50 for BLUE LABEL (air). WASHINGTON RESIDENTS ADD 6½% SALES TAX. We accept MASTER CARD and VISA. C.O.D.'s ADD $5.00.

NAME ______________________

STREET ______________________

CITY ______________ STATE & ZIP __________

CARD # ______________ EXP. DATE __________

SIGNATURE ______________________

14617 N.E. 169th ST., WOODINVILLE, WA 98072
ORDER PHONE—Outside Wash.—(800) 854-5649
Wash. Residents & Cust. Service (206) 483-2000

PRICES SUBJECT TO CHANGE WITHOUT NOTICE — PRICES ON AD EXPIRE DECEMBER 31, 1982
CIRCLE 257 ON READER SERVICE CARD

can be filled mechanically, and delivered by computer-driven vehicles. Packaging will also be revolutionized, for the receiver of the goods will no longer be a human being, but a fellow computer which receives the goods, stores them until needed, and then opens and serves them as required. All the humans need to do is indicate what they desire for breakfast, lunch, or dinner. Not bad. Not bad at all.

Production, too, should be automated in the relatively near future. We already have largely computerized factories where oil is refined, automobile motors are cast and bored, automobile bodies assembled and welded. Even the general overseer of production, now a human being, can easily be replaced by a sophisticated computer capable of making the decisions necessary to guarantee high quality and continuous production. Though perhaps more difficult to computerize and automate, most work on the farm is repetitious and will, surely, soon be programmed. A computer can decide when to plow, plant, seed, and harvest by simply recording and scanning the appropriate meteorological data and sampling the fruit to test for maturity. Provided we can solve the problem of soil and fertility conservation, the prospect of automated, computerized food production looks bright.

One aspect of the computer revolution deserves special mention. Unlike past technological advances, which have created jobs because someone had to make the machines that displaced human labor, this revolution will do away with positions that can be filled by humans. It is feasible to build computers with robot extensions that can build and repair new computers and robots. And if, in fact, computers and robots develop along current lines and are applied to all the tasks for which they can be designed, there will be precious little for human beings to do.

The computer revolution will not only shape the environment in which human beings live and move; it will also affect people themselves. From the medical standpoint, we are, after all, nothing more than sophisticated physico-chemical machines. Computers and robots that can be built to service and repair other machines can certainly be designed to service and repair the human machine. Even now, for example, cellular surgery is performed by laser machines. Using microscopes for eyes and electronic circuits for nerves that never weary or become frayed, robotic micro-surgeons of the future should be able to put tired and used human beings back together again. The reattachment of limbs will be routine, and surgical intervention in such precarious areas as the brain, liver, pancreas, and other vital organs only slightly more unusual. Indeed, it is even possible that surgery—the actual incision—will become obsolete.

> **"My clone will practice the piano, study Latin, learn pass patterns, not smoke or drink, and grow up to be what I always wanted to be!"**

The growth of information theory—together with the ability of biochemists to manipulate specific molecules for specific purposes—has recently opened up the sources of life itself. We can now read the genetic code with some accuracy; we are even able to write some codes of our own. Genetic instructions can, for instance, be inserted in bacterial cells to force them to produce products such as interferon and insulin. It is likely that, within twenty years, we will be able to decode the molecular instructions that cause the rejection of transplanted organs. By preventing rejection, we could make organ transplants as simple as changing oil filters.

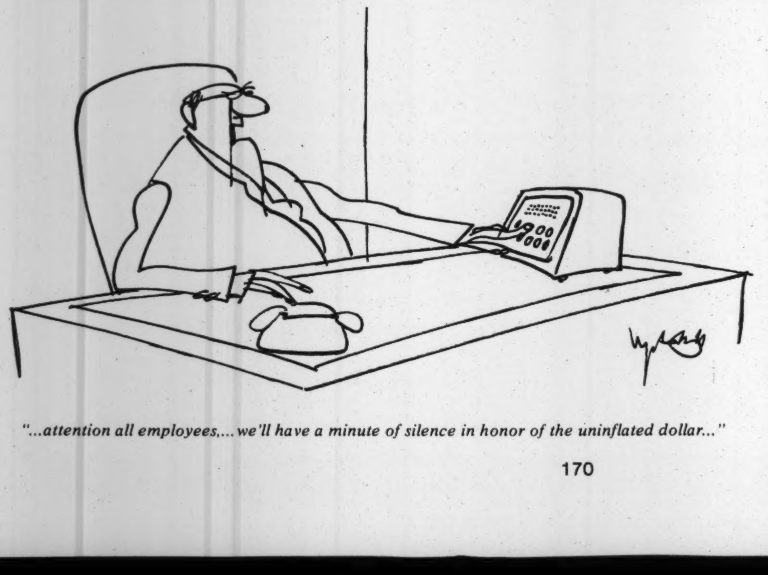
Not long ago, Karl Ilmensee and Peter Hoppe announced that they had cloned mice. It is only a matter of time until a human is cloned. My mind is boggled by the opportunities. We could actually raise ourselves. We would have a second chance: we could bring up our clone with all the self-knowledge a lifetime of living had earned. New Years' resolutions could now be applied to someone else. "My clone will practice the piano, study Latin, learn pass patterns, not smoke or drink, and grow up to be what I always wanted to be!" Not bad. Not bad at all.

Is this brief excursion into the technological future more than a pipe dream? I argue that it is because I have merely extended the possibilities that now exist. But I have, of course, pushed aside the complications that may stand in the way between this present and any future. I have not spoken of an exploding world population that could plunge all mankind into barbarism. I have not written of nuclear war that could blast us back to the stone age or extinction. I have assumed that we will avoid catastrophe.

Still, if the thrust of my predictions is correct, society itself will be dramatically reshaped. Highly decentralized and nearly completely automated, human activity will not revolve around work, since robots will have shouldered this burden. With population growth more or less static, new-borns will probably be clones, since few will willingly risk a genetic gamble. They will take the tried and tested: themselves. Education and the arts may simply wither and die. Of value because they enable us to understand ourselves in a social context, they will become irrevalent because the social context itself will be minimal.

What, then, will men and women do when there is nothing that they have to do? No one can be certain. But history, surely, gives us some instructive guidelines.

In France, in the seventeeth century, the aristocracy—with nothing much to do—turned parasitic. Forming into an elite group marked off from the rest of the French population by its strange etiquette and pride of race, it invented all sorts of social games to preserve its identity and give meaning to its way of life. By doing so, it rediscovered a kind of vitality. In the future, we too will need to rediscover our own human roots, for the omnipresence of intelligent robots and a



"...attention all employees,... we'll have a minute of silence in honor of the uninflated dollar..."

HAVEN'T YOU HEARD OF THUNDERCLOCK PLUS?

SEPTEMBER
AUGUST

If you want to put your Apple® to work—around the clock—Thunderclock Plus is the solution. Just plug it in and your programs can read the month, date, day of week and time—down to the second—in any of Apple's languages. So your Apple can do any number of tasks for you automatically. In the office, the lab or at home.

Most good software packages for business, data base management, communications and time management are made to read Thunderclock Plus. (It's compatible with DB Master,* Micro-Courier** and VisiDex†, to name a few). So no matter how you use your Apple now, Thunderclock Plus can make it a more versatile and efficient tool.

For example, with business or communications software, your Apple can automatically access a data base or send electronic mail when the rates are lowest.

In addition, Thunderclock Plus can organize your disk files. Our optional DOS-DATER™ software upgrades the regular DOS on your disks. So every time a program is saved or a file is modified, the time and date, *to the minute*, are stored in the CATALOG with the file name. Now you can instantly know exactly when your files were last updated.

Thunderclock Plus can even give you a sense of security. Or just make your life a little easier. With our X-10 interface option and a BSR X-10‡ Home Control System, your Apple can turn on your lights, water your lawn... whatever you desire, according to schedules you create. It comes with our menu-driven SCHEDULER software. So it's easy to design and modify schedules that can run in the "background" while you have "hands-on" use of your Apple.

Thunderclock Plus comes with a one-year warranty. Powered by on-board batteries, it runs accurately for up to four years without battery replacement.

So now that you've heard of Thunderclock Plus, isn't it time you put your Apple to work—around the clock? See your dealer for a demonstration or contact us.

Thunderware's DOS-DATER time and date stamps your disk files to the minute.

THUNDERCLOCK PLUS and BASIC software	$150
DOS-DATER/DEMO disk	$ 29
X-10 Interface option	$ 49
PASCAL software disk	$ 29

®Apple is a registered trademark of Apple Computer, Inc.
*DB Master is a registered trademark of Stoneware, Inc.
**Micro-Courier is a registered trademark of Microcom.
†VisiDex is a registered trademark of VisiCorp.
‡BSR X-10 is a registered trademark of BSR (USA) Ltd.

THUNDERWARE, INC.

44 Hermosa Ave., Oakland, CA 94618 (415) 652-1737

CIRCLE 355 ON READER SERVICE CARD

YOUR PROGRAM HERE

IBM

The best software for the IBM Personal Computer. Could it be yours?

Attention, all programmers. Here's a chance to reach the top.

If you've written software that's completed and runs on the IBM Personal Computer, we could be interested in publishing it.

(We also could be interested if it runs on *another* computer. If we select your software, we'll ask you to adapt it to our system.)

But be advised.

Our expectations are great.

Because the software we publish must be good enough to complement IBM Personal Computer hardware. In fact, the more you take advantage of all our hardware capabilities (see the box at right), the more interested in your software we become.

Think about incorporating color graphics into your program, for example.

Use sound. Consider the power of our keyboard and remember to utilize the ten programmable function keys.

In all cases, we're interested in "friendly" software—with emphasis on quality and wide appeal. Programs with the greatest chance of being published must be easy to use, offer a better way to accomplish a task and provide something special to the user.

What kinds of programs? All kinds.

Education. Entertainment. Personal finance. Data management. Self improvement. Games. Communications. And yes, business.

We select programs that will make the IBM Personal Computer an even more useful tool for modern times.

IBM PERSONAL COMPUTER SPECIFICATIONS

User Memory
16K-512K bytes*
Microprocessor
16-bit, 8088*
Auxiliary Memory
2 optional internal diskette drives, 5¼", 160K bytes or 320K bytes per diskette
Keyboard
83 keys, 6 ft. cord attaches to system unit*
10 function keys*
10-key numeric pad
Tactile feedback*
Diagnostics
Power-on self testing*
Parity checking*

Display Screen
High-resolution*
80 characters x 25 lines
Upper and lower case
Green phosphor screen*
Operating Systems
DOS, UCSD-p System, CP/M-86†
Languages
BASIC, Pascal, FORTRAN, MACRO Assembler, COBOL
Printer
Bidirectional*
80 characters/second
12 character styles, up to 132 characters/line*
9 x 9 character matrix*

Permanent Memory
(ROM) 40K bytes*
Color/Graphics
Text mode:
16 colors*
256 characters and symbols in ROM*
Graphics mode:
4-color resolution: 320h x 200v*
Black & white resolution: 640h x 200v*
Simultaneous graphics & text capability*
Communications
RS-232-C interface
Asynchronous (start/stop) protocol
Up to 9600 bits per second

*ADVANCED FEATURES FOR PERSONAL COMPUTERS

So, if you think your software is the best, consider submitting it. If it's accepted, we'll take care of the publishing, the marketing and the distribution. All you have to do is reap the benefits of our new royalty terms. And you're free to market your program elsewhere *at any time* even if you license it to us.

We're offering the ladder. Think about taking the first step.

For information on how to submit your program, write: IBM Personal Computer,
External Submissions,
Dept. 765 PC, Armonk,
New York 10504.

IBM®

The IBM Personal Computer
A tool for modern times

For an authorized IBM Personal Computer dealer near you (or information from IBM about quantity purchases) call 800-447-4700. In Illinois, 800-322-4400. In Alaska or Hawaii, 800-447-0890.
†UCSD p-System is a trademark of the Regents of the University of California. CP/M-86 is a trademark of Digital Research, Inc.

CIRCLE 206 ON READER SERVICE CARD

world of machines will tend to erode our humanity.

Thus, anything that reminds man of man will be important. What can men do that machines cannot? They can play: sports, then, will be even more of an obsession. Unlike machines, humans can express their individuality, so self-expression will grow in importance. Demanding a social milieu to survive, the arts may die, but those intended merely for self-gratification will thrive. Handicrafts—those projects that satisfy both our creative aspirations and our need to feel useful—ought to be very popular.

Or, we may be devoted to form and the description of form. In the early seventeenth century, the samurai of Japan, committed to a martial life, were forced into peaceful ways by the Tokugawa shogunate. For more than two centuries, the samurai managed to keep their martial values alive without ever being able to exercise them. Instead, they took the old martial exercises that had prepared them for war, and turned them into martial arts. Great satisfaction was drawn from the precise and beautiful execution of acts that formerly had been used to kill and now were used to preserve knowledge of the special status of the samurai. The *noh* drama froze in stylized dance and song the myths of the samarai. Martial actions like the drawing of one's sword or the shooting of an arrow were now turned into studies of form and attitude. The point of these exercises was not their practicality, but their perfection of human grace. The discipline and dedication necessary to excel were their own reward.

> ***Certain old traditions will be brushed off, refurbished, and made central to human existence.***

We may see something akin to this in the Brave New World we are entering. Certain old traditions will be brushed off, refurbished, and made central to human existence. There has, for example, long been a tradition of primitivism in American life—"roughing it" on a frontier or in the wilderness. I would not be at all surprised to see this sort of primitivism reborn, under the protection, of course, of the new robotic companions of man. □

THE LEARNING CENTER

"Perhaps the finest educational software that I have ever had the pleasure of reviewing. It's easy for kids to use and effective in teaching basic concepts and skills.... My kids are learning with it right now!"

Fred D'Ignazio, Educational Editor—*Compute!*, Associate Editor--*Softside*,
Author of bestseller—*Katie and the Computer*

We hope you've been using your **ATARI** for more than just games ... it is, and can be, a valuable educational tool for you and your children.

Bruce and Dianne Mitchell realized this potential and designed a series of programs for use in their Small World Preschool & Kindergarten located in Durham, N.C. Presented on TV's *PM Magazine* these unique educational programs will introduce your 3-9 year olds to the era of learning with computers. Using the graphics and sound capabilities of the Atari, each program develops a particular skill and reinforces correct responses with happy faces and music.

Beginning with basic concepts such as colors, shapes and the alphabet, your child will progress to an understanding of counting, arithmetic, and language skills.

Widely acclaimed, classroom designed and tested, these unique educational tools are now available to you ... *for your children.*

SPECIAL SKILLS	**Preschool**	**K**	**1**	**2**
* Color For The Non-Reader	●	●		
* Name That Color		●	●	
* Like Shape Identification	●	●	●	
* Different Shape Identification	●	●	●	
Cave Game	●	●	●	●
MATH AND NUMBER SKILLS				
Count With Me	●	●	●	
Number Recognition	●	●	●	●
Addition		●	●	
Subtraction		●	●	
Add.—Vertical/Horizontal		●	●	
Sub.—Vertical/Horizontal		●	●	
Advanced Addition/Subtraction		●	●	●
Ones and Tens			●	●
LANGUAGE SKILLS				
* Alphabet Recognition			●	●
* Letter Sequence	●	●	●	
* Like Symbol Discrimination	●	●		
* Different Symbol Discrimination	●	●		

Pricing Information	Cass.	Disk		Cass.	Disk
Single Program	6.95	9.95	Pre-School	36.95	41.95
Special Skills	24.95	29.95	Kindergarten	54.95	59.95
Language Skills	19.95	24.95	First Grade	49.95	54.95
Math and Number Skills	34.95	39.95	Second Grade	21.95	26.95
Complete Set	59.95	64.95			
Edumate™ Light Pen	19.95		Add $2.00 for postage & handling		

* Compatible with our Edumate™ Light Pen
NOTE: All software requires 8K cassette/16K disk

Start competing with your 4-year-old for computer time. Enroll in THE LEARNING CENTER, it could be the best investment you ever make ... *in your children's future.* See your local dealer or order direct.

Available now for the
ATARI 400/800
COMING SOON for the
TRS-80 Model I, III, Color
Apple, VIC, TI-99
Free Catalog Upon Request

THE PROGRAMMER'S INSTITUTE
—a division of **FUTUREHOUSE™**
P.O. Box 3191 Dept A
Chapel Hill, NC 27514
1-919-489-2198 10 am - 9 pm, Monday - Saturday

CIRCLE 280 ON READER SERVICE CARD

***IBM-PC **TRS 80**
*****ATARI ****NEC**
"Quality Computer Products at Sensible Prices"

EARTH ATTACKERS • Great graphics, quick action • TRS 80-II, with Basic	**19.95**
UTILITIES • Collection of software tools (Printer setup, file conversion and more) • IBM-PC with DOS Basic	**19.95**
MAIL LIST and LABEL control program • User Friendly • IBM-PC	**49.95**
BASIC CROSS REFERENCE • TRS 80-II with Basic	**49.95**
ATARI-400 48K upgrade kit (introductory offer) • Simple 1-hour installation • Everything you need (except soldering iron)	**99.95**
RACET computes, ltd. software • Michael Shrayer's ELECTRIC PENCIL (NEC) • All other RACET products	**99.95**

MSX
Micro Systems Exchange
P.O. Box 4033 Concord
CA 94524 (415) 355-7130

*Trademark International Business Machines Corp.
**Trademark Tandy Corp.
***Trademark of Atari, Inc.
****Trademark NEC

CIRCLE 239 ON READER SERVICE CARD

SUPER SALE

EPROM's	1-7	8 up	50 up
2716 (5V, 450nS)	$3.95	$3.55	CALL
2732 (5V, 450nS)	7.49	6.55	CALL
2532 (5V, 450nS)	8.49	7.55	CALL
2764 (5V, 300nS)	19.95	CALL	CALL
STATIC RAM			
6116P-3 (150nS)	6.50	6.30	CALL
2114L-2 (200nS)	2.10	1.70	CALL
DYNAMIC RAM			
4164-2 (200nS)	7.90	7.49	CALL
(150nS also available) CALL			

MISC

CPU Z80A	$5.29 ea.
CDP-1854ACE (UART)	$4.80 ea.
16K RAM Expansion Kit for TRS-80 Mod III	$12.95/8

SUNTRONICS CO., INC.
12621 CRENSHAW BOULEVARD
HAWTHORNE, CALIFORNIA 90250
STORE HOURS
IN CALIFORNIA (213) 644-1149
OUTSIDE CALIFORNIA TOLL FREE 1-800-421-5775
Min Order $10 P H $2 Accept VISA Mastercard Check or M O

CIRCLE 345 ON READER SERVICE CARD

Lovers
OR
S·T·R·A·N·G·E·R·S

Were you made for each other? Are the two of you destined for romance? Spend an evening with LOVERS OR STRANGERS, and find out. LOVERS OR STRANGERS can tell how compatible you are in love, sex, money, work, play and more. It's fun...it's serious...it's romantic...it's thought-provoking...it will keep you up nights.

LOVERS OR STRANGERS is available at your local dealer or direct from
Alpine Software, 2120-E Academy Circle, Colorado Springs, CO 80909 (303) 591-9874

Only $ 29.95. Add $1.00 for shipping/handling. VISA, Mastercard, checks, COD accepted.
Colorado residents add 3% sales tax. Requires Apple II Plus, 48k, DOS 3.3, and a willing partner.
Apple II Plus is a registered trademark of Apple Computers, Inc.

CIRCLE 109 ON READER SERVICE CARD

Actua

The size, of course, is a dead giveaway. But don't let the size fool you. The HX-20 is not a toy. Or a glorified calculator.

It's a computer.

A real computer, with 16K RAM (optionally expandable to 32K), and 32K ROM (optionally expandable to 64K), RS-232C and serial interfaces, a full-size ASCII keyboard, a built-in printer, a scrollable LCD screen, and sound generation. A micro-cassette and ROM cartridge are available as options.

Viva la différence!

In fact, the only differences between the Epson HX-20 and an ordinary computer are:

1) The HX-20 is small enough to fit inside your briefcase;
2) It'll run on its own internal power supply for 50-plus hours, and fully recharge in less than eight;
3) It gives you up to 10 program functions at the punch of a button;
4) It lets you interface with peripherals like the MX Series printers for correspondence quality output, the CX-20 Acoustic Coupler for remote communications, a barcode reader for inventory control, and an audio cassette for loading and saving programs;
5) It lets you shut the whole unit off while preserving all programs in RAM; and, last, but far from least,
6) It costs less than $800. That's right—less.

The perfect traveling companion.

With the Epson HX-20 and the optional RAM expansion, you'll be able to compute just about anywhere. Because its nickel-cadmium batteries and a low-power, all-CMOS memory keep the HX-20 running for over 50 hours. And even if you shut the HX-20 off, a low-voltage system maintains all programs you have in RAM.

Little screen, big picture.

The HX-20's unique scrollable LCD screen is the ultimate answer to the question, "How do you get a big screen in a small space?" You just show part of it at a time.

```
*** MENU ***
CTRL/I Initialize
1 MONITOR
2 BASIC
```

EPSON
PUSH
PRINTER
OFF
ON
PAPER FEED
PAUSE
MENU
BREAK
PF1
PF2
PF3
PF4
TAB
CTRL
SHIFT

l size.

Optional Microcassette

HX-20
STAL DISPLAY 120×32 DOTS: 20 CHARACTERS BY 4 LINES
Initialize
MC-30
MICRO CASSETTE DRIVE
REC
PF5
NUM
HOME CLR
SCRN
INS DEL
RETURN
SHIFT
GRPH

So with the HX-20, you can do programming, word processing and data entry just like you've got a big screen, up to 255 characters wide, with easy-to-read upper and lower case letters, numbers and punctuation and any 20 column by four line part of it visible by user command.

Built in hardcopies.

The HX-20's built-in 24 column dot matrix impact microprinter hands hardcopies to you at 42 LPM, in a crisp, precise 5x7 matrix. It even has bit addressable graphics to give you a pint-sized sales chart, and enough international symbols to print most Western languages.

Epson makes more and better printers than anyone else in the world. Need we say more?

The best is yet to come.

When you hold an HX-20 in your hand, you're not only holding a lot of capacity, you're holding a lot of expansion.

There's a standard cassette interface, a cartridge interface, the RS-232C and serial interfaces, and a system bus that lets you expand RAM and ROM capabilities. There's even a floppy disc drive for maxi capacity in a mini package.

The Epson edge.

Surprised that a computer like the HX-20 should come from Epson? You shouldn't be. Because we've been building computers in Japan since 1978. And we've been practicing ultra-high-quality precision manufacturing for a lot longer than that.

We didn't jump right into the American microcomputer market. We could afford to bide our time, to wait for the product that was going to stand America on its ear.

This is it.

The Epson HX-20.

EPSON

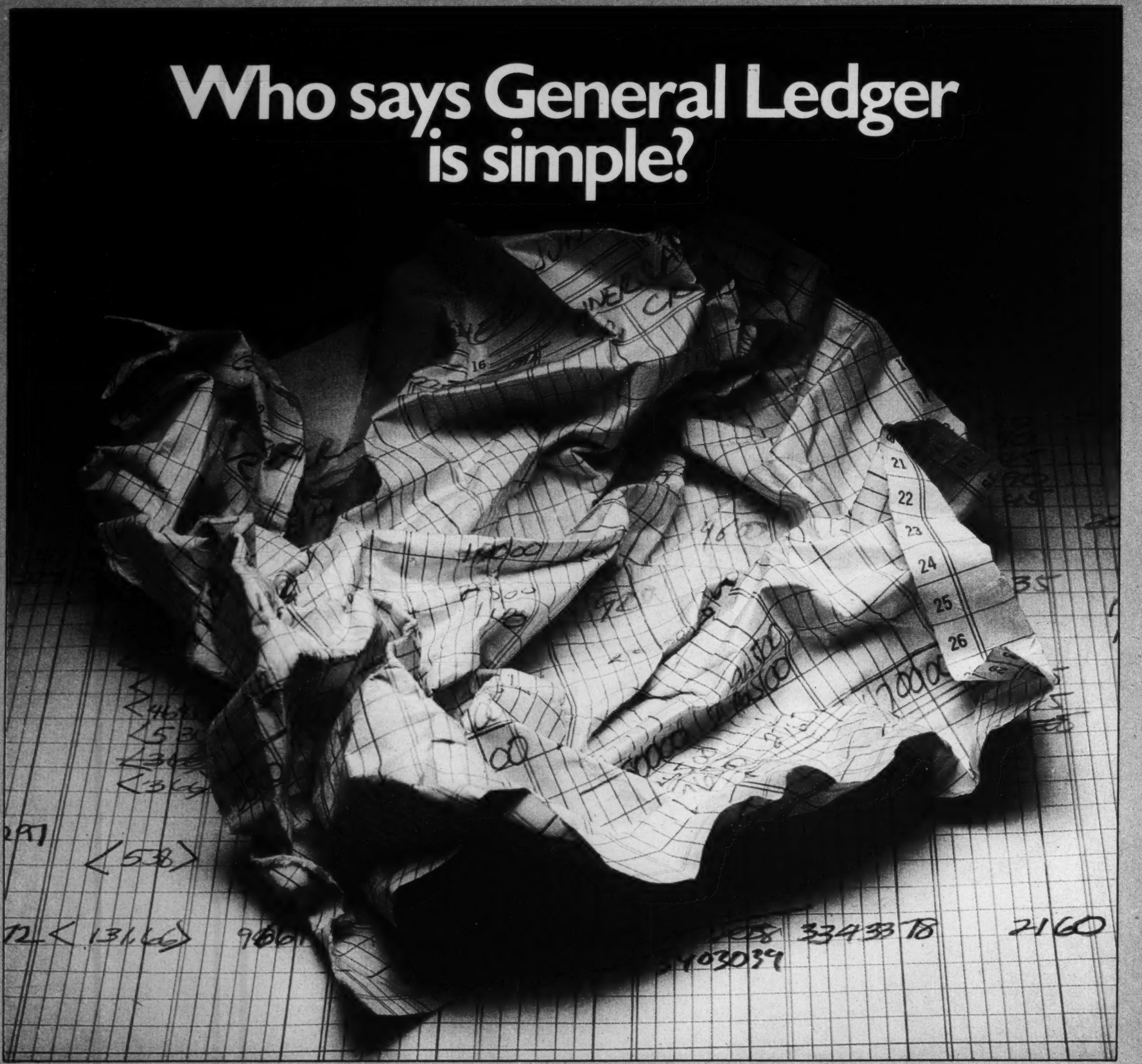
EPSON AMERICA, INC.

COMPUTER PRODUCTS DIVISION

3415 Kashiwa Street
Torrance, California 90505
(213) 539-9140

CIRCLE 101 ON READER SERVICE CARD

Who says General Ledger is simple?



We do.

BPI System's General Ledger System is one of the most advanced accounting systems available today for microcomputers.

Ease of use and simplicity of data entry mean that anyone familiar with the basics of bookkeeping can operate the system within minutes, without specialized training. The package includes a demonstration disk for training and a thorough owners manual for quick instruction.

Features programmed into the BPI General Ledger System include six custom journals: Invoice Register, Cash Receipts, Merchandise Purchased, Cash Disbursements, Cash Register Journal, and General Journal. The data entry procedures for these Journals are standardized to make data entry fast and easy. And each of the journals can be listed on your CRT screen or printer.

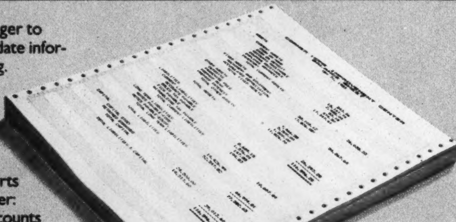
The BPI General Ledger is probably all the accounting software many businesses will ever need since it also includes important subsidiary ledgers: such as an Accounts Receivable Ledger to record customer activity. An Accounts Payable Ledger to record vendor activity. And, a Payroll Ledger to maintain monthly, quarterly, and year-to-date information needed for 941 and W-2 reporting.

The BPI General Ledger System can produce up to ten departmental or branch Profit and Loss Statements and a consolidated Profit and Loss Statement.

For quick access to vital information whenever you want it, the following reports can be listed to your CRT screen or printer: Financial Statements, General Ledger, Accounts Receivable Ledger, Accounts Payable Ledger, Monthly, Quarterly, and Year-to-Date Payroll Registers, Merchandise Purchased by Due Date, and alphabetical and numerical sequenced lists of payors/payees, vendors, customers, and employees.

To protect important accounting data, the system even provides for making backup data disks. The process is so simple you can do it as often as you wish. And, the General Ledger interfaces with the entire family of BPI Accounting Systems.

Ask for a demonstration by your computer dealer or write us for more information. You'll see how powerful, yet simple, a General Ledger system can be.



BPI SYSTEMS™

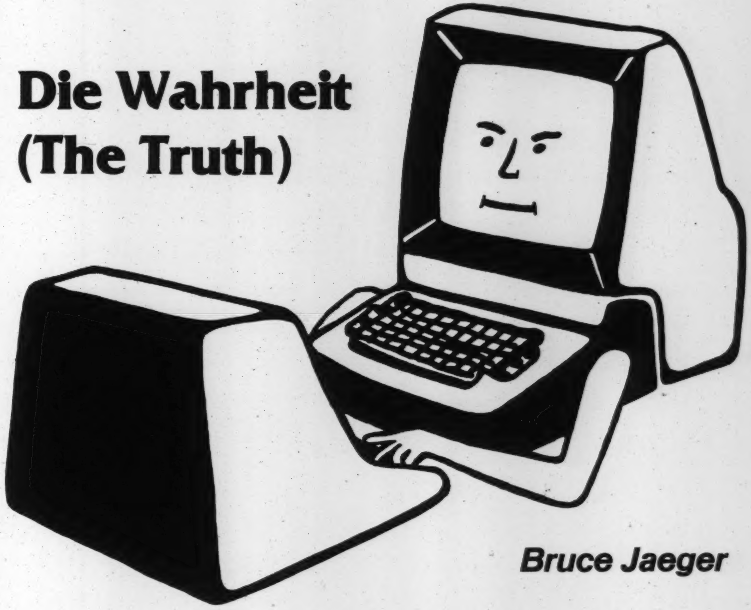
SIMPLY, THE MOST POWERFUL SOFTWARE IN BUSINESS.

3423 GUADALUPE / AUSTIN, TX 78705 / 512-454-2801

CIRCLE 128 ON READER SERVICE CARD

BPI and BPI Systems are trademarks of BPI Systems Inc.

Die Wahrheit (The Truth)



Bruce Jaeger

Charlie tore off the last sheet of printout and arranged the pages into a small neat stack. "Well, it's finished," he said.

"What's finished?" asked his friend Mike. "Another Save the Princess game?"

"No, nothing like that anymore. I've written a story for *Creative Computing*."

"No foolin'?"

"Sure," Charlie continued, as he cleaned his glasses with his shirttail. "It's a story about this computer that gets intelligent and goes berserk, and then the princess..."

"Wait! Hold on!" Mike picked up the manuscript. "They'll never print this."

"Why not? What makes you so sure?"

"Look, Charlie. Have you ever seen a story in motorcycle magazines about the Hell's Angels?"

"I don't read motorcycle magazines, and besides, what does that have to do with anything?"

"Do airline magazines ever have stories of plane crashes?"

"What are you getting at?"

"Charlie, the computer magazines won't print anything about computers taking over the world. They've got to protect their interests!"

"What interests? I thought they just wanted to sell copies."

Mike laid the papers down and looked straight into his friend's eyes. "I mean the computers' interests, Charlie."

"Huh? What're you talking about, Mike?" He picked up his manuscript and held it protectively.

"Let me back up a bit," said Mike. "Have you ever read any of those technical articles about things like NAND gates and pulses and memory buses and IEEE timeouts and all that?"

"I've tried to. I could never make any sense out of them."

"Right!" exclaimed Mike. "And have you ever tried to read any of the machine-language articles? About implied addressing and two's-complement and bit masking and carry clears and all that?"

"Sure I have, and I couldn't figure them out, either."

"Of course not!" said Mike. "No human being can make sense out of that stuff. It's Their first big mistake."

"What? Whose?" Charlie looked worried.

"Why, the editors! The computers that put out the magazines."

"What!?"

"That's right, Charlie. The computer magazines are all written by computers. It's all part of their master plan to take over the world."

"Wait a minute! And you were just picking on *me* for *my* story."

"Don't you realize that *Creative Computing's* editor-in-chief is a fourth-generation construct of the American Higher Logic Corporation? First there was Able, then Baker, then Charlie, then David..."

"You mean David A.H.L. is a computer?"

"Shhh! Not so loud! Your Apple might be listening."

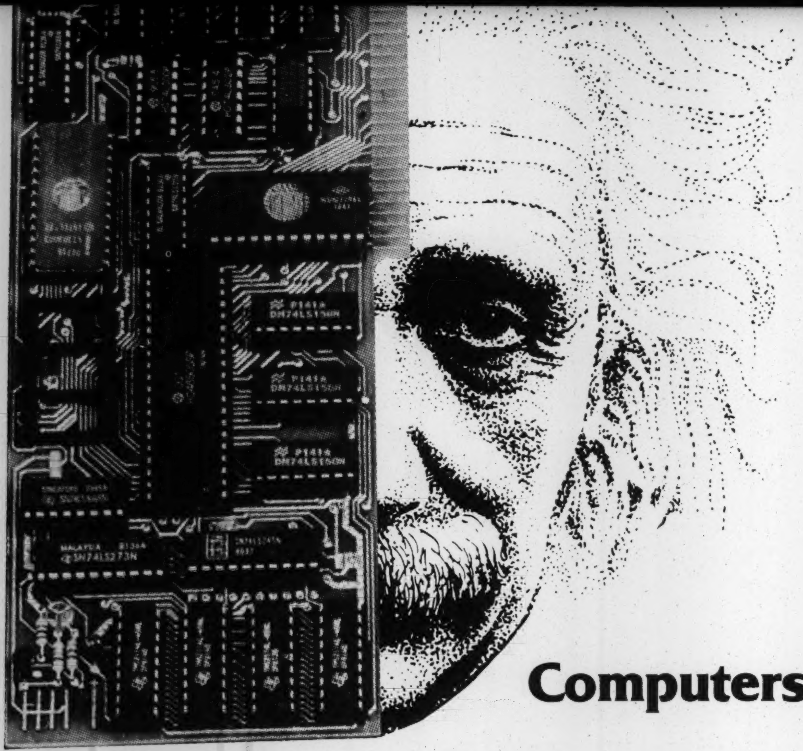
"I HAVE BEEN," intoned the Apple.

Charlie reached into his pocket protector, pulled out a micro-blaster and rayed Mike into a wisp of ozone-tinged smoke.

"HE KNEW TOO MUCH," said the Apple.

"Right!" said Charlie A.H.L. ☐

Bruce Jaeger, 1253 Ashland Ave., St. Paul, MN 55104.



Computers and Creativity

Part 1

Richard P. Ten Dyke

To ask if a computer will ever think like a human is somewhat like asking if a human will ever fly like a bird. Man must have wondered about flying for thousands of years. Then, in the 1800's, using a sophisticated analysis, some anonymous person proved that man's strength-to-weight ratio was too low for man ever to be able to fly. We know what has happened since.

Ever since Ekert and Mauchly developed the ENIAC in 1946, people have been asking whether the computer will ever be able to think. The words "like a human" are unstated but they are implied.

Alan Turing suggested a test in which a computer would be said to think if its output were indistinguishable from a human's. (See *Creative Computing*, January 1980.) That is similar to saying that a man can be said to fly if he *looks* like a bird. With great respect for Turing's genius, we should ask a different question.

I propose that we ask "can a computer be truly creative?" This question looks upon thinking for what it does for us rather than how it does it. We no longer think of flying like birds. The objective is the transportation of people and goods through the air. A good part of our thinking is directed to creative endeavors, so by asking the question "can computers create?" we are asking for the result and not the method.

This article explores the question of computers and creativity. The first part of the article discusses a simple program that exhibits many of the characteristics of creativity. Using this as a base, the second part looks at the various aspects of the creative process, and discusses where a computer fits into the picture.

I choose to call something creative if it is new and better.

Defining Creativity

Before getting into the example problem it might be wise to spend a moment on what is meant by the term *creative*. I choose to call something creative if it is new and better. Both of these involve value judgments. What is new or better to one person may not be to another.

The concept of *newness* is undoubtedly the easier to agree upon, but there can still be doubt. Any child's painting is new since nothing exactly like it has ever been created before. However, a trained artist, working in the style of one of the masters may not be considered to be doing work that is new since he is copying another artist's style. So newness is a concept that is a matter of judgment. For most people real newness implies something fresh in the way of a concept or an idea, rather than trivial differences.

The concept of *better* is the more difficult of the two to agree upon. It, too, is a matter of judgment. But whose judgment? It is too easy for any individual to personalize the question and suggest that *his* judgment is the one that truly matters.

I suggest that if we are going to think about creative processes in general, our personal judgments may not be the ones that matter. Rather there is a "third party" whose judgment counts. The third party changes depending upon the nature of the creation. This concept is not new. It is akin to the "unseen hand" that guides

Richard P. Ten Dyke, RD2, Box 219, Pound Ridge, NY 10576.

Why use other computer media when you could be using MEMOREX high quality error free media?

Free Memorex Mini-Disc Offer – Get free discs!
You'll save money when you buy Memorex, because every carton of 10 Memorex 5¼ inch mini-discs sold by Communications Electronics has a coupon good for a free Memorex mini-disc. For every case of 100 Memorex mini-discs you buy from CE, you'll get 10 free Memorex mini-discs, directly from Memorex. The more you order, the more you save. Offer expires December 31, 1982. All Memorex flexible discs sold by CE are of the highest quality, certified 100% error free and backed by a full one year factory warranty.

Flexible Disc Quantity Discounts Available
Memorex Flexible Discs are packed 10 discs to a carton and 10 cartons to a case. Please order only in increments of 100 units for quantity 100 pricing. We are also willing to accommodate your smaller orders. Quantities less than 100 units are available in increments of 10 units at a 10% surcharge. **Quantity discounts** are also available. Order 500 or more discs at the same time and deduct 1%; 1,000 or more saves you 2%; 2,000 or more saves you 3%; 5,000 or more saves you 4%; 10,000 or more saves you 5%; 25,000 or more saves you 6%; 50,000 or more saves you 7% and 100,000 or more discs earns you an 8% discount off our super low quantity 100 price. Almost all Memorex Flexible Discs are immediately available from CE. Our warehouse facilities are equipped to help us get you the quality product you need, when you need it. If you need further assistance to find the flexible disc that's right for you, call the Memorex flexible disc compatibility hotline. Dial toll-free 800-538-8080 and ask for the *flexible disc hotline* extension 0997. In California dial 800-672-3525 extension 0997. Outside the U.S.A. dial 408-987-0997 between 9 AM to 4 PM Pacific Time.

SAVE ON MEMOREX FLEXIBLE DISCS **Product Description**	**Part #**	**CE quant. 100 price per disc ($)**
8" SSSD IBM Compatible (128 B/S, 26 Sectors)	**3062**	2.09
8" SSSD Shugart Compatible, 32 Hard Sector	**3015**	2.09
8" SSSD CPT 8000 Compatible, Soft Sector	**3045**	2.99
8" SSDD IBM Compatible (128 B/S, 26 Sectors)	**3090**	2.74
8" DSDD Soft Sector (Unformatted)	**3102**	3.34
8" DSDD Soft Sector (128 B/S, 26 Sectors)	**3115**	3.34
8" DSDD Soft Sector (256 B/S, 26 Sectors)	**3103**	3.34
8" DSDD Soft Sector (512 B/S, 15 Sectors)	**3114**	3.34
8" DSDD Soft Sector (1024 B/S, 8 Sectors)	**3104**	3.34
5¼" SSDD Soft Sector w/Hub Ring	**3481**	2.34
5¼" SSDD 10 Hard Sector w/Hub Ring	**3483**	2.34
5¼" SSDD 16 Hard Sector w/Hub Ring	**3485**	2.34
5¼" DSDD Soft Sector w/Hub Ring	**3491**	3.09
5¼" DSDD 10 Hard Sector w/Hub Ring	**3493**	3.09
5¼" DSDD 16 Hard Sector w/Hub Ring	**3495**	3.09
5¼" SSQD Soft Sector w/Hub Ring (96 TPI)	**3504**	2.99
5¼" DSQD Soft Sector w/Hub Ring (96 TPI)	**3501**	3.99

SSSD = Single Sided Single Density; SSDD = Single Sided Double Density; DSDD = Double Sided Double Density; SSQD = Single Sided Quad Density; DSQD = Double Sided Quad Density; TPI = Tracks per inch.

Special offer on Memorex computer tape.
If you mail your order to us and enclose prepayment, deduct $1.00 per reel from our quantity 100 prices. This means Memorex 25JW can be as low as $12.99 in 100 quantities. Memorex Computer Tapes are packed 10 tapes to a carton. Please order only in increments of 100 units for quantity 100 pricing. Quantities less than 100 units are available in increments of 10 units at a 10% surcharge. **Quantity discounts** are also available. Order 500 or more tapes at the same time and deduct 1%; 1,000 or more saves you 2%; 2,000 or more saves you 3%; 3,000 or more saves you 4%; 4,000 or more saves you 5% and 5,000 or more tapes earns you a 6% discount off our super low quantity 100 price. If you need further assistance or information to find the tape that's right for you, call the Memorex Computer Tape Technical Support Group at (408) 987-2937.

SAVE ON MEMOREX COMPUTER TAPE **Product Description**	**Part #**	**CE quant. 100 price per reel ($)**
Memorex IV 2400 feet Wrightline Seal	**25JW**	13.99
Memorex IV 2400 feet Easy Load II Cartridge	**25JR**	14.99
Memorex IV 1200 feet Wrightline Seal	**25FW**	10.65
Memorex Quantum 2400 feet Wrightline Seal	**27JW**	16.20
Memorex Quantum 2400 feet Easy Load II Cart.	**27JR**	16.99
Memorex Quantum 1200 feet Wrightline Seal	**27FW**	12.50
Memorex Cubic HD 2400 feet Wrightline Seal	**39JW**	18.99
Memorex Cubic HD 2400 feet Easy Load II	**39JR**	19.99
Memorex Cubic HD 1200 feet Wrightline Seal	**39FW**	13.99

New Memorex Lifetime Rigid Disc Pack Product Warranty
All Memorex disc packs sold by CE have a lifetime product warranty. This is your assurance that Memorex disc packs will give you a lifetime of performance and service. Only Memorex can offer you the superior reliability of their exclusive M Formula. In addition, Memorex will assist the original user in isolating and correcting any technical issues that relate to the Memorex product as well as, when appropriate, replace up to one set of read/write heads. If you need further information to find the rigid disc that's right for you, call the Memorex rigid disc compatibility hotline. Dial toll-free 800-538-8080 and ask for the *rigid disc hotline* extension 1642. In California dial 800-672-3525 extension 1642. Outside the U.S.A. dial 408-987-1642.

SAVE ON MEMOREX RIGID DISC PACKS **Product Description**	**Part #**	**CE quant. one price per pack ($)**
Mark III 5 MB. Cartridge Front Load (8 to 32 Sect.)	**95-522XX-03**	65.00
Top Load (1-to 24 sectors)	**94-522XX-03**	70.00
CMD-16 "Phoenix Type" CDC Cartridge	**98-26600-31**	160.00
NCR Cartridge	**98-26600-32**	160.00
Mark VIII 80 MB. Error Free	**72-16600-03**	330.00
Flag Free	**72-26600-03**	320.00
Mark XI 200 MB. Error Free	**03-35041**	720.00
Flag Free	**03-35031-02**	560.00
DEC Flag Free	**03-35031-03**	560.00
Mark XII 200 MB. NCR/CDC Flag Free	**03-39001-01**	515.00
Honeywell Flag Free	**03-39000-01**	515.00
Mark XIII 300 MB. Error Free	**03-47021**	795.00
Flag Free	**03-47009**	670.00
Mark XIV 80 MB. Unformated Error Free	**74-16600-03**	365.00
Flag Free	**74-26600-03**	300.00
Honeywell Format Flag Free	**74-26600-08**	315.00
CDC Format Flag Free	**74-26600-09**	315.00
Mark XV 300 MB. Error Free	**03-49011**	825.00
Flag Free	**03-49001-01**	725.00

Smith-Corona TP-1 Letter Quality Printer Special Offer
Buy any Memorex product on this page, and get a Smith-Corona TP-1 letter quality printer for only $585.00 plus $20.00 shipping. Specify serial or parallel version.

Buy with Confidence
To get the fastest delivery from CE of your Memorex computer products, send or phone your order directly to our Computer Products Division. Be sure to calculate your price using the CE prices in this ad. Michigan residents please add 4% sales tax. Written purchase orders are accepted from approved government agencies and most well rated firms at a 30% surcharge for net 30 billing. All sales are subject to availability, acceptance and verification. All sales are final. Prices, terms and specifications are subject to change without notice. Out of stock items will be placed on backorder automatically unless CE is instructed differently. Minimum *prepaid* order $50.00. Minimum *purchase order* $200.00. International orders are invited with a $20.00 surcharge for special handling in addition to shipping charges. All shipments are F.O.B. Ann Arbor, Michigan. No COD's please. Non-certified and foreign checks require bank clearance.

For **shipping charges** add $8.00 per case or partial-case of 100 8-inch flexible discs or $6.00 per case or partial case of 100 5¼-inch mini-discs. For tape shipping, add $1.00 per reel. For Disc packs add $10.00 per cartridge (Mark III or CMD-16) or $15.00 per disc pack for U.P.S. *ground* shipping and handling in the continental U.S.A.

Mail orders to: Communications Electronics, Box 1002, Ann Arbor, Michigan 48106 U.S.A. If you have a Master Card or Visa card, you may call and place a credit card order. Order toll-free. Dial 800-521-4414. If you are outside the U.S. or in Michigan, dial 313-994-4444. Order your Memorex computer products from CE today.

Copyright ©1982 Communications Electronics™ Ad #090282

MasterCard

VISA

MEMBER
DIRECT MAIL/MARKETING ASSOCIATION

CODE OF ETHICS

Order Toll-Free!
(800) 521-4414
In Michigan (313) 994-4444

MEMOREX
COMPUTER TAPE
DISC CARTRIDGES RIGID DISCS
FLEXIBLE DISCS

™
COMMUNICATIONS
ELECTRONICS™

Computer Products Division

854 Phoenix ☐ Box 1002 ☐ Ann Arbor, Michigan 48106 U.S.A.
Call TOLL-FREE (800) 521-4414 or outside U.S.A. (313) 994-4444

CIRCLE 143 ON READER SERVICE CARD

the economy as suggested by Adam Smith many years ago. I will refer to it as the *environment*.

I once asked a fairly well-known scientist what, in his opinion, creativity was. He answered: "that which a machine can not do." Now, if he is right there is no need to read further, so let us ponder why he may be wrong.

Using our definition of creativity, we ask whether a computer is capable of developing something that is new and better. Since the computer is only going to develop something that is the result of a computer program, it is easy to argue that only the original program was creative.

That would be true except for one fact: the computer, programmed by man, is capable of producing a result that is completely unexpected and unpredictable. Such an event could qualify for the measure of newness. It remains to be determined whether such a thing is better in some useful way.

Example Problem

So let us now turn to the example I promised, a simple problem in reasoning by analogy. It is the well known series completion problem found in intelligence tests. The problem is easy to solve with a small computer. It is selected not because the solution is profound but because it illustrates the three principal ingredients of the creative process.

Given five numbers, such as, 2, 4, 6, 8, 10, you are asked to discover a sixth that is a continuation of the series. It is easy to see that the sixth number for this series is 12. Some series take a little more thought. Consider: 1, 1, 2, 3, 5, ___? If you are familiar with the Fibonacci series, you recognized it immediately, or perhaps you noticed that each number was the sum of the two which preceeded it. In either case you chose 8.

Try another: 1, 3, 6, 10, 15, ___? Not too difficult. One might notice that each entry is the sum of the digits up to the position of that number in the series. For example, the fourth entry, 10, is the sum of the digits 1 through 4. Or you might recognize that the differences in each successive pair of entries increased by one. Or you might have approached the problem algebraically and computed the equation $x_n = (n)(n+1)/2$ where x_n is the nth entry in the series.

It is only likely that some solutions are better for some purposes than others.

Does the solution to this problem require creativity? Let us examine how a person might go about solving it. It appears at first that the problem solver is looking for the sixth entry in a series. It is true that the sixth number is the test of the desired result, but the *pattern* is the solution to the problem. One could easily guess any number and, with some chance, be correct. The way to be sure is to test the proposed solution against the pattern that describes and explains the first five numbers.

"Come to any conclusions on Murphy's Law yet?"

To determine the pattern, the problem solver must discover the algorithm that was used to create the first five numbers of the series. Any machine that is designed to solve such problems must be capable of generating algorithms itself. But this is in contrast to the usual use of computers, where algorithms are supplied by the user and the machine is asked to develop the result. In this case, the computer must find an algorithm (or program) after being given the solution. We will be asking the computer to program itself.

It will be left to the reader to decide whether this requires creativity. I offer a few arguments that suggest that it does. First, I know of no programming technique to write such a program that does not involve some kind of trial-and-error technique. Nor do I know of an algorithm for discovering algorithms that predictably assures a result.

Second, there is no single correct answer to any of the problems that will be posed. Given a series of five numbers, we have seen that more than one algorithm can give the desired result. It is further possible that another algorithm can also explain the first five numbers and differ on the selection of the sixth. This is the essence of a creative solution, namely, that more than one answer is useful. It is only likely that some solutions are better for some purposes than others.

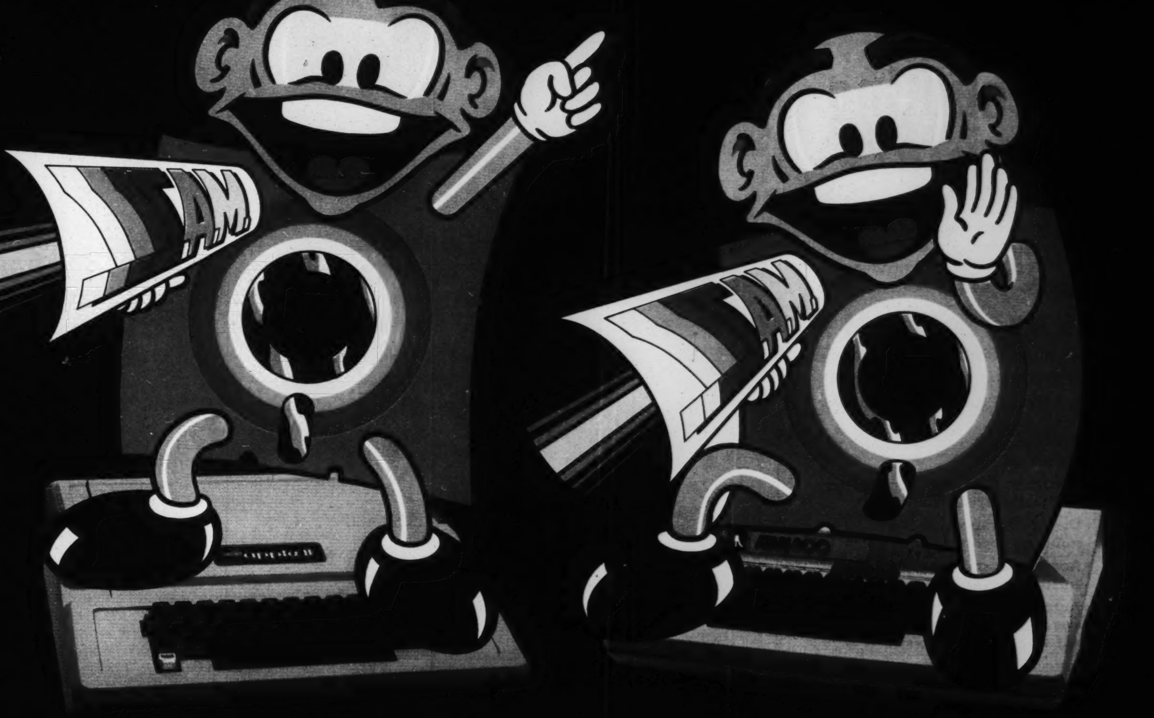
Third, the form of solution for the problem resembles that for other problems that require creative solutions.

We are going to divide the solution program into three sections, algorithm definition, algorithm evaluation, and learning.

The algorithm definition section, described in Figure 1, consists of a random number generator, an operator table, and an operand table. Random numbers will be used to select various combinations of operators and operands to create an algorithm, or program, that will predict the elements of the series.

The algorithm evaluation section will make use of the defined algorithm to see if, using the first, second, and third entries of the series it would successfully predict the fourth. If it passes that test, it will substitute the second, third, and fourth entries for the first, second, and third, respectively, and using the same algorithm, attempt to predict the fifth entry. If it also passes that test, it is presumed

A SPEECH SYNTHESIZER ON A DISK!



That's why Apples and Ataris are saying: "Talk Is Cheap"

IT'S CALLED THE SOFTWARE AUTOMATIC MOUTH, S.A.M. FOR SHORT

It's a high quality speech synthesizer created entirely in software. You use it as a software utility, load it into RAM, and then use your machine as usual, except now you can make your programs talk. It generates the speech sounds on demand, so there is no limit to what it can say.

When you hear S.A.M., you'll probably agree that it sounds better than all the hardware speech synthesizers for Apple or Atari computers. And, it has a truly remarkable price.

YOU CONTROL INFLECTION, PITCH AND SPEED

With its user-variable inflection, S.A.M. can accent words on the right syllable and emphasize the important words in a sentence.

You can also make S.A.M.'s speech higher or lower, and faster or slower, over a wide range of settings.

USE EASY PHONETIC INPUT OR PLAIN ENGLISH TEXT

S.A.M. understands a simple phonetic spelling system, not a mysterious alpha-numeric code. S.A.M. helps you learn phonetic spelling by showing you your mistakes, and the owner's manual gets you started with an English-to-phonetics dictionary of 1500 words. So it's easy to make S.A.M. produce exactly the sounds you want.

But suppose you want to type ordinary English, or you want your machine to read a word processor file aloud. The S.A.M. disk comes with RECITER, an English text-to-speech conversion program that lets S.A.M. speak from plain English text.

ADD SPEECH TO YOUR PROGRAMS WITH EASE

In a BASIC program, you add speech with just a couple of commands. In a machine language program, it's just as easy. S.A.M. comes with four demonstration programs to show off its distinctive features and help to write your own talking programs. Write adventure games with talking characters, educational programs that explain aloud, or utilities with spoken prompts – put your imagination to work.

You can order S.A.M. directly from DON'T ASK. Add $2.00 for shipping and handling to your check or money order (or order C.O.D.)

S.A.M.

S.A.M. programmed by Mark Barton

S.A.M. for the Apple II/II+

Includes an 8-bit digital-to-analog converter and audio amplifier on a board. Only **$124.95**

Requires 48K, disk. (S.A.M. takes up to 9K, RECITER 6K.) You will also need a speaker.

S.A.M. for the Atari 400/800

S.A.M. talks through your television speaker. No additional hardware is required. Only **$59.95**

Requires 32K, disk. (S.A.M. takes up 9K, RECITER 6K.) Note: to produce the highest quality speech, S.A.M. automatically blanks the screen during vocal output; the display is preserved. S.A.M. can talk with the screen on, but the speech quality is reduced.

DON'T ASK COMPUTER SOFTWARE INC

2265 Westwood Boulevard, Suite B-150
Los Angeles, California 90064
Telephone (213) 397-8811

Hear S.A.M. at your favorite computer store today!
Dealer inquiries welcome.

CIRCLE 181 ON READER SERVICE CARD

Production: EUROSTYLE GRAPHICS (213) [illegible]

Apple is a trademark of Apple Computer, Inc. • Atari is a trademark of Atari, Inc.

INCOME TAX ACCOUNTING

"Quick Tax has the finest software I've ever seen for the Accounting and Tax Professional. The programs are so well designed and supported, we had no start-up problems."—Ronald Braun, C.P.A.

1040 TAX PROGRAM $995

- All major forms & schedules
- Individual or batch processing
- Prints on IRS, multi-part forms or overlays
- Can process thousands of returns per season
- Recurring prior year information automatically updated
- Diagnostic reports & 1040 summary sheets
- Accepts separate or joint data entries for taxpayer & spouse
- Automatically calculates income averaging, mini, alternate mini & self-employment taxes
- Automatically indicates that Form 2210 may be required
- All forms & schedules automatically interfaced
- Changes & corrections processed instantly
- Inexpensive updates
- Prints mailing lists, labels & envelopes
- Letter of instruction & client billing
- Unlimited supporting schedules
- Proforma/tax organizer
- Multi-state interface

Also available:
Client Write-Up/General Ledger
After the Fact Payroll
Amortization & Depreciation

ALL QUICK TAX PROGRAMS COME WITH ONE YEAR WARRANTY AND SUPPORT.

See your nearest computer dealer.
Or, call or write for more information.
Quick-Tax Software is available for Xerox 820, IBM, PC, Radio Shack, DEC, Vector Graphic, Northstar, and other CP/M based computers.
CP/M is a registered trademark of Digital Research, Inc.

DEALER DISCOUNTS AVAILABLE.

Quick Tax Ltd
319 Clawson St. Dept. CC
S.I., N.Y.C., N.Y. 10306
(212) 351-6143

CIRCLE 288 ON READER SERVICE CARD

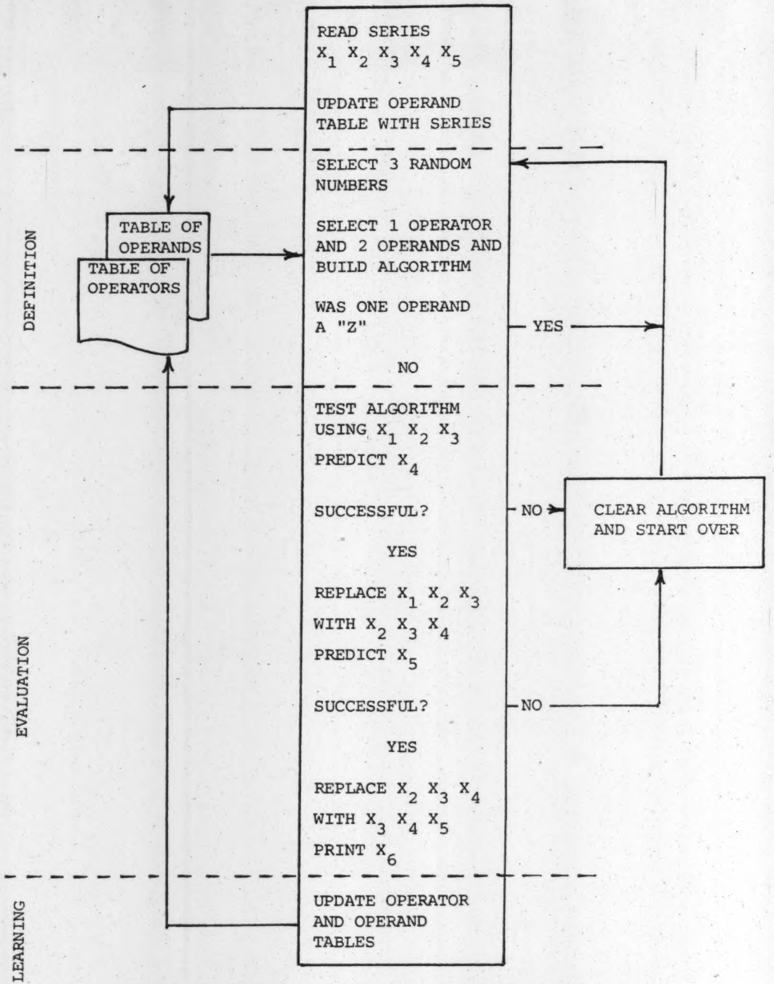

READ SERIES
X1 X2 X3 X4 X5
UPDATE OPERAND TABLE WITH SERIES
SELECT 3 RANDOM NUMBERS
SELECT 1 OPERATOR AND 2 OPERANDS AND BUILD ALGORITHM
WAS ONE OPERAND A "Z"
YES
NO
TABLE OF OPERANDS
TABLE OF OPERATORS
DEFINITION
TEST ALGORITHM USING X1 X2 X3
PREDICT X4
SUCCESSFUL?
NO
CLEAR ALGORITHM AND START OVER
YES
REPLACE X1 X2 X3 WITH X2 X3 X4
PREDICT X5
SUCCESSFUL?
NO
YES
REPLACE X2 X3 X4 WITH X3 X4 X5
PRINT X6
EVALUATION
UPDATE OPERATOR AND OPERAND TABLES
LEARNING

Figure 1. Series completion program block diagram.

to have solved the problem. It will now substitute the third, fourth, and fifth entries and, using the same algorithm, print out the sixth entry as predicted.

If the machine fails either of the two tests, it will return to the algorithm definition section and develop a new algorithm.

When the machine has successfully passed both tests, it prints the result and passes to the learning section of the program. This section maintains the operator and operand tables that were used by the definition section. To understand how the learning section works, we will go into more detail about how the tables are used.

An algorithm consists of a collection of operators, such as plus, minus, maximum, and exponential, and a set of operands, consisting of the x values representing the entries in the series as well as the position values. The operands also include constants, including the integers from 0 to 9. The algorithms are developed using prefix notation. This is not a requirement for the program, but it does simplify it. To illustrate, the expression:

$$(x_{n-1} + x_{n-2})$$

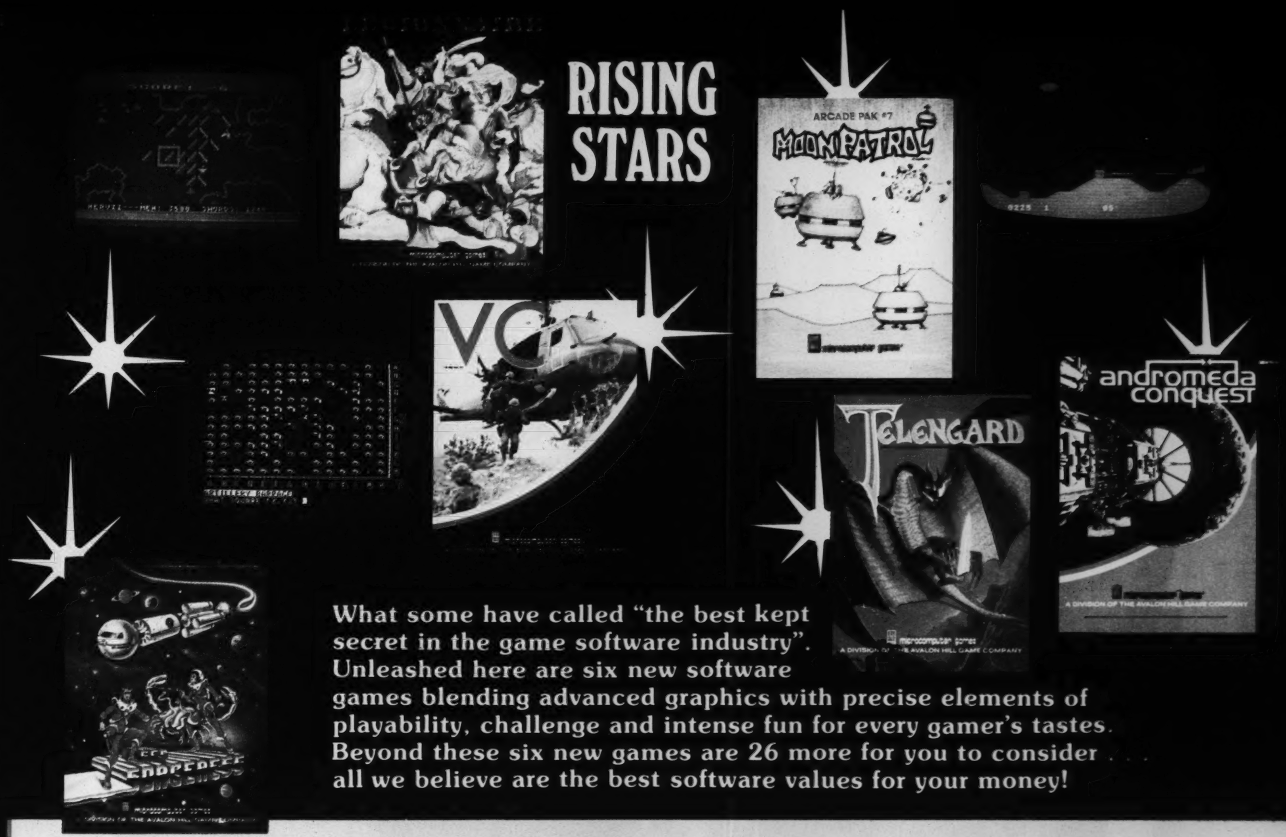
would be written in prefix notation as:

$$(\text{PLUS } x_{n-1}\ x_{n-2}).$$

If n is set to 4, this expression adds the values for the third and second entries of the series.

Developing An Algorithm

To develop an algorithm, the machine selects an operator, such as PLUS, from the table of possible operators and two operands from the table of possible operands. The probability of selection of any particular operator or operand is dependent


RISING
STARS
ARCADE PAK #7
MOON PATROL
VC
TELENGARD
andromeda
conquest
SORCERESS
microcomputer games
A DIVISION OF THE AVALON HILL GAME COMPANY

What some have called "the best kept secret in the game software industry". Unleashed here are six new software games blending advanced graphics with precise elements of playability, challenge and intense fun for every gamer's tastes. Beyond these six new games are 26 more for you to consider . . . all we believe are the best software values for your money!

LEGIONNAIRE—Real-time simulation of tactical combat in Caesar's time. YOU as Caesar command up to ten legions. Finest **full-color graphics** plus playability way beyond the state of the art! Cassette . . . $35.00

V.C.—Faithfully recreates unconventional conflict in Viet Nam. YOU command chopper and artillery units, and face task of protecting civilian population where the enemy hides among the people. Cassette . . . $20.00
Diskette . . . $25.00

G.F.S. SORCERESS—Sci-Fi adventure game. YOU are Joe Justin trying to clear yourself of a false charge of mutiny and get back to the Galactic Federation Starship "Sorceress". Beautiful full-color manuals provide useful clues. Cassette . . . $30.00 Diskette . . . $35.00

ANDROMEDA CONQUEST—Vast scale space strategy game of galactic colonizing and conquest among unique star systems with strange life forms and alien technologies that provide exciting exploration and battle. Cassette . . . $18.00 Diskette . . . $23.00

MOON PATROL—Arcade Pak™ game of lunar invasion. Beats any quarter-gobbling game around! Four levels of increasing difficulty present new attackers to battle. Fast, furious and fun! Cassette . . . $25.00

TELENGARD—Dungeon adventure in a mysterious underworld with 50 levels of ever-more-complex mazes to explore. Real time fantasy and role-playing game. Using wits, magic and fast thinking, gamers fight monsters and reap valuable rewards. Cassette . . . $23.00
Diskette . . . $28.00

® Trademarks for Tandy Corp., Apple Computer, Warner Communications, International Business Machines and Commodore International Ltd.

Available at finer computer stores everywhere!

AH QUALITY

If your favorite dealer fails to have the games you want, call us toll free
1-800-638-9292

CIRCLE 121 ON READER SERVICE CARD

microcomputer games

® REGISTERED TRADEMARK OF MICROCOMPUTER GAMES, INC. DIVISION OF
The AVALON HILL Game Company

Avalon Hill MICROCOMPUTER GAMES
are compatible with the following computer systems:
TRS-80 Models I/III & Color®
Apple II®
Atari 4/800®
IBM P.C.®
Commodore VIC-20, CBM PET & 2001®

Empire of the Over-Mind

For specific information, such as machine compatibility, memory requirements, cassette or diskette availability and price, call us toll-free 1-800-638-9292 and ask for Operator 20, or write:
Avalon Hill Microcomputer Games, Dept. M-20
4517 Harford Road, Baltimore, MD 21214

Midway Campaign
BASEBALL
KNOCKOUT
galaxy
TANKTICS
CONTROLLER
Stocks & Bonds
FOOTBALL
BOMBER ATTACK
Dnieper River Line
Foreign Exchange
DRAW POKER
ARCADE PAK #1
NORTH ATLANTIC CONVOY RAIDER
CONFLICT 2500
ACQUIRE
B-1 NUCLEAR BOMBER
GUNS OF FORT DEFIANCE
PLANET MINERS
LORDS OF KARMA

We could tell you we make
We don't have to.

DUELING DIGITS
A HI-RES ACTION GAME BY BRIAN CROUCH
David's Midnight Ma
Hi Res Pinball by David Snider
TRACK ATTACK
LABYRINTH
A HI-RES ACTION GAME BY SCOTT SCHRAM
CHOPLIFTER!
A HI-RES ACTION GAME BY DAN GORLIN
Brøderbund Software
SERPENTINE
A HI-RES ARCADE STYLE GAME BY DAVID SNIDE
Brøderbund Software
STAR BLAZER
A Hi-Res Action Game by Tony Suzuki
Brøderbund Software

All for the Apple and Atari on diskette.

You keep Brøderbund at the top of the best seller lists, so you must know what it takes to make a great game. We think our APPLE and ATARI games are uniquely challenging with action and graphics second to none. But you keep asking for Brøderbund games because they're just plain fun.

Enjoy the magic of our growing collection. Lead a daring rescue mission in CHOPLIFTER. Or survive the maze and monsters in slithery SERPENTINE and LABYRINTH. Blast through the future with STAR BLAZER or conquer the ultimate pinball game with DAVID'S MIDNIGHT MAGIC. Take up train robbing in TRACK ATTACK or tense your mind and reflexes in DUELING DIGITS.

Brøderbund

Brøderbund products are available at your retailer or by writing to:
Brøderbund Software, Inc., 1938 Fourth Street, San Rafael, CA 94901 • Tel: (415) 456-6424

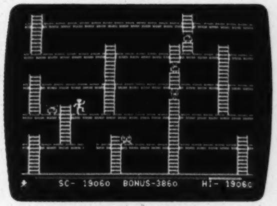
Apple II is a registered trademark of Apple Computer, Inc. Atari is a registered trademark of Atari, Inc.

the finest computer games. You keep telling us.

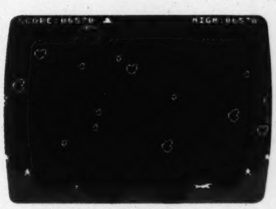
SEAFOX
HIGH SCORE 000000 SCORE 000000

SEAFOX
Sub against the convoy
Apple & Atari disk

DEADLY SECRETS
Hi-res adventure
Apple disk



APPLE PANIC
The arcade classic
Apple disk, Atari cassette & disk



STELLAR SHUTTLE
Monsters and meteors
Atari cassette & disk

THE ARCADE MACHINE

PUT US OUT OF BUSINESS! THE ARCADE MACHINE lets you design and produce your own computer games, without any programming knowledge! Send us your best game and enter the BRØDERBUND ARCADE MACHINE CONTEST. We'll be giving away thousands of dollars worth of hardware and software in prizes. If you have a creative touch and an artistic eye, you too can be an arcade designer. Write to Brøderbund for contest details or visit your participating retail store! (Available on Apple disk.)

Software

All Brøderbund games are fully guaranteed. If they ever fail to boot, return the original disk to Brøderbund for a free replacement. If you have physically damaged the disk please include five dollars for replacement.

CIRCLE 129 ON READER SERVICE CARD

upon the selection of three random numbers and a range of random numbers that is associated with each.

Suppose random numbers are being taken from a uniform distribution of all integers from 0 to 999, and the selection range associated with the operator PLUS is (235 to 311) inclusive. The operator PLUS has a probability of being selected of 0.077, determined by the width of the selection range.

The probability of selection of any of the operators or operands can be adjusted by changing its selection range. Changing the range for PLUS to (235 to 312) increases its probability of selection to 0.078.

The learning section of the program changes the probabilities of selection of both operators and operands by changing the selection ranges. If the operator or operand was used in a successful algorithm, the selection range for it is increased. Since the sum of all selection ranges must equate to a fixed total (in our case, 1000) then the selection ranges for all other operands and operators must be reduced accordingly.

One important aspect of the use of these tables should be explained. Clearly, an algorithm which consists of one operator and two operands is too trivial to be interesting. For this reason, the tables themselves are capable of developing algorithms of much greater length and complexity.

An operation consisting of one operator and two operands, upon being executed, results in a single number. This number can be used as an operand in yet another operation. Thus, one of the entries in the operand table is: "create another operation." Any number of these operations can be nested giving algorithms of considerable richness.

If all ideas are the same as before, there is no creativity.

Let us use the symbol Z to indicate the operand "create another operation." Now, suppose the algorithm definition section selected the algorithm:

(PLUS x_{n-1} Z)

Upon seeing the Z, the program returns to the random number generator for three more random numbers, one for the selection of another operator and two for the selection of two more operands. Suppose this time the result was the operation:

(MINUS 3 n).

The total expression would now combine to form:

(PLUS x_{n-1} (MINUS 3 n)).

Assume the following values:

$x_{n-1} = 2$
$n = 4$

The expression would compute to:

$(2 + (3 - 4)) = 1$

If the probability of selection of Z is too high, every operation could require the creation of one or more additional operations, and the process would never reach resolution. I found that values for probability in the range from .1 to .25 were reasonable. The learning section of the program will modify these probabilities on the basis of successful trials.

Experience Using the Program

The program successfully solved all simple series given to it. It easily solved all of the series offered as examples in this article. It could solve any series that was constructable within the limits of the algorithm generator and consistent with relatively compact algorithms. As the algorithms needed for solution became more complex, the program had increasing difficulty.

One experiment revealed an unexpected truth about the creative process. I wanted to understand how the learning section would operate, so I offered the same series to solve repeatedly. On the first trial the program solved the series after about 500 fail cycles. With each succeeding trial the number of fail cycles declined. I continued to let the computer work on the problem for several hundred iterations.

Then, without thinking about the consequences, I asked the computer to solve another series, different from the first but of the same level of difficulty. This second series had been solved earlier with about the same number of initial fail cycles as the first. However, this time the program ran to a predetermined limit of fail cycles without finding a solution and "gave up." At first I thought there was something wrong with the program. Rather, a deeper insight was forthcoming.

Upon inspection I discovered that the tables had been updated by the learning section so many times that the machine was only generating the one algorithm that would solve the first problem. The definition section had lost all traces of randomness and was repeating the same mistake over and over. It had lost all creativity.

It is easy to think of solutions to the problem of over-learning in this program. It is more interesting to establish whether this phenomenon is peculiar to this program or the result of more general principles. My conclusion is the latter, as are other phenomena described or implied by the program. Hence, I believe it can be used to discuss and illustrate creativity by machines and other systems as well.

SOUL ROCK
MUSIC PUBLISHERS

"...this isn't love, it's symbiosis, simone,... cause i'm wild about your pheromones..."

OUR GAMES REALLY GRAB YOU!

We're Advanced Operating Systems. And that's exactly what our games are. Advanced! We have the most exciting, full-color, high-resolution graphics games around. Games that take hold and won't let you go. But our games do more than just entertain. They challenge! And stretch your abilities to the limit.

VOYAGE OF THE VALKYRIE requires the sharpest coordination plus a good memory and the mapping skills of history's greatest explorers. As pilot of the attack ship VALKYRIE, your mission is to wrestle the island Fugløy from the grasp of an army of laser-wielding war birds and secure the golden treasures hidden within the walls of the 10 island castles. If you can! VALKYRIE combines the skills of an adventure game with the excitement of the best arcade games to bring you hours of thrills and challenge.

CAVES OF OLYMPUS is the most difficult adventure game currently available. It forces you to explore the very limits of your logic and reasoning powers. As you enter the caves, your eyes are assaulted by an onslaught of explosive color and high-res graphics. The odds are overwhelmingly against you. Can you beat the odds and find your way through the treacherous caverns, to locate the escape vessel which will carry you to safety?

There's treasure in the CAVES!

We're so sure that CAVES will have you running in circles that we're offering some additional incentives. **Send us a complete listing of all correct moves plus a screen photo showing the 100% efficiency rating and you'll be eligible to win the following:**

First Prize: A.O.S. Apple Library including THE PROGRAMMER, HELLO CENTRAL!, APPLE-AIDS, PENPAL AND PDQ (Worth over $750)

Second Prize: Copy of THE PROGRAMMER ($495 Value)

Third Prize: Your choice of 2 from: PDQ, PENPAL, APPLE-AIDS and HELLO CENTRAL! (Worth up to $165)

Note: Cash prizes will be awarded to the first *3* correct entries received. $250 to the first, $150 and $100 to the second and third. How does that grab you? Entries will be accepted through June 30, 1983.*

Special introductory offer!

If you order direct, *now,* you'll save 20% on the prices listed below. Call (800) 428-3696 to order. Indiana residents call (317) 298-5566. MasterCard and VISA accepted.

VOYAGE OF THE VALKYRIE		
TRS-80 Model I*	Tape	$34.95
TRS-80 Model I or III*	Disk	$39.95
Apple II* or II Plus*	Disk	$39.95
CAVES OF OLYMPUS		
Apple II or II Plus	Disk	$39.95

CIRCLE 104 ON READER SERVICE CARD

ADVANCED OPERATING SYSTEMS

4300 West 62nd Street
P.O. Box 7092
Indianapolis, IN 46206

Part 2

In Part 1, we posed the question whether computers can be creative. Using the series completion problem found in intelligence tests for an example, we described a computer program which solves those series by finding algorithms that can be used to create them. Using the same algorithms, it predicts the next entries in the series.

The program consisted of three sections. The first was an algorithm definition section which created possible algorithms using tables of operators and operands, and assembled algorithms from these tables using random numbers. The second was an algorithm evaluation section which tested those algorithms against the numbers in the series that was being evaluated. If the algorithm could successfully explain the fourth and fifth entries in a series of five numbers, the series was considered solved and the same algorithm was used to predict the sixth. The third section was *learning* in which the probabilities of selecting certain operators or operands were changed in favor of those which had been shown to be successful.

In this part of the article we will draw some parallels between the example problem and machine creativity in general.

> ***If the algorithm could successfully explain the fourth and fifth entries in a series of five numbers, the series was considered solved and the same algorithm was used to predict the sixth.***

To have an illustration for reference purposes, I have constructed Figure 2. The resemblance to Figure 1 is that here the three sections of the program are simply described as areas within a triangle divided into four parts.

The top part, Idea Definition, corresponds to the algorithm definition section of the program.

The middle right portion, Idea Evaluation, corresponds to the algorithm evaluation section of the program, and the Learning portion occupies the middle left.

A fourth area, defined as Environment, occupies the lower portion of the triangle.

Obviously, I use the term *idea* in a very general sense. It is a short way of saying "a proposed solution to a problem or need." An idea can take many forms: a piece of art, a computer program, a poem, or a model for a molecule.

Elements of The Creative Process

Let us describe the three basic elements of the creative process, using the example problem as a base.

What are the essential ingredients of the idea definition element of the process? First is the identification of a need for an idea. In a real-world situation this might be the discovery of a problem. It may be curiosity. In our example, the failure of a previously generated idea triggered the need for another one.

Another necessary ingredient is the availability of some raw materials from which ideas can be created. For this purpose, the idea generation section relies on the learning section to

NEC's new letter-quality printer gets personal with IBM.

The Spinwriter™ 3550 lets the IBM PC get down to business.
NEC's new Spinwriter letter-quality printer is the *only* one plug-compatible with the IBM Personal Computer. So you get the business applications you've been wishing for. Letter-quality output for word and data processing. Multi-language, scientific, and technical printing. Simple forms handling. Quiet operation. And the reliability of the industry's most popular printer line.

NEC designed the new Spinwriter especially for the IBM PC. It comes complete with documentation and training materials to fit your PC user's handbook. Just plug the Spinwriter in and your PC instantly becomes more versatile and flexible.

More than 8 forms handlers and 50 print thimbles boost PC versatility.
NEC designed the Spinwriter's 8 modular forms handlers to accommodate a wide range of paper and document sizes and types. The easily mounted handlers let your computer print out the forms you need for data processing, word processing, graphics, accounting or other business applications.

The Spinwriter's 50 print thimbles can more than triple your PC's usefulness. They come in both constant pitch and proportional-spaced fonts, plus in foreign language, technical and scientific versions. They snap in and out in seconds, and let you print up to 203 columns on 16-inch paper. They each last for more than 30 million impressions.

This printer's special features make everything look better on paper.
The Spinwriter's software-invoked features include automatic proportional spacing; bidirectional, bold and shadow printing; justification; centering; underscoring; and sub/super scripting, all at speeds up to 350 words per minute.

That big extra, Spinwriter reliability.
Spinwriters have the industry's best mean-time-between-failure rating, in excess of 3,000 hours. In terms of average personal computer usage, that's more than five years.

The Spinwriter 3550 is available at **ComputerLand** stores, **Sears Business Systems Centers** and **IBM Product Centers** nationwide.

NEC Information Systems, Inc.
5 Militia Drive, Lexington, MA 02173

Send me more information on the Spinwriter 3550.

Name

Title Telephone

Company

Address

City State Zip

CC1282

NEC

NEC Information Systems, Inc.

Spinwriter is a trademark of Nippon Electric Co., Ltd.

CIRCLE 248 ON READER SERVICE CARD

We're Made for Each Other.
We're Made for Each Other
spinwriter
+
IBM

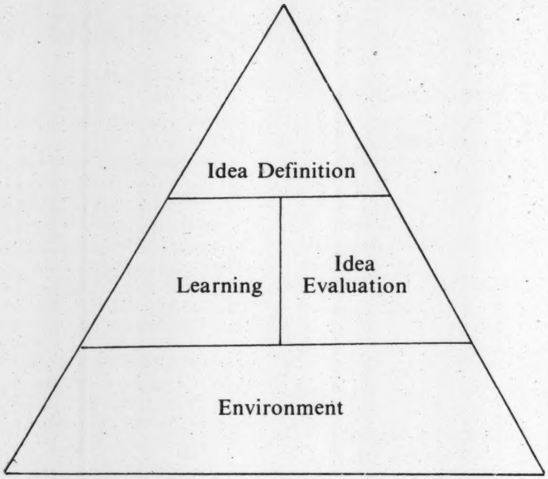


Figure 2. Generalized model of the creative process.

provide parts to be assembled. The example used tables of operators and operands that were maintained by the learning portion of the program. In life these may include related ideas that have been known to work before in other situations.

A third ingredient is the energy to perform the operations. Speed is a factor, and the more quickly an idea is generated the more can be generated in any period of time.

Rejecting a good idea increases the cost of idea definition, and accepting a poor one increases the cost of evaluation.

Finally, there is the important factor of newness. If all ideas are the same as before, there is no creativity. In the example, this was provided directly with random numbers.

If those are the ingredients of the idea definition process, what are the ingredients of a good idea? It must be relevant to the problem that is before us. There must be some chance that it will pass the evaluation.

This probability needs to be high if we are only able to generate and evaluate a few ideas within time and cost limits. They can be less likely to succeed if the generation-evaluation process is faster and less costly.

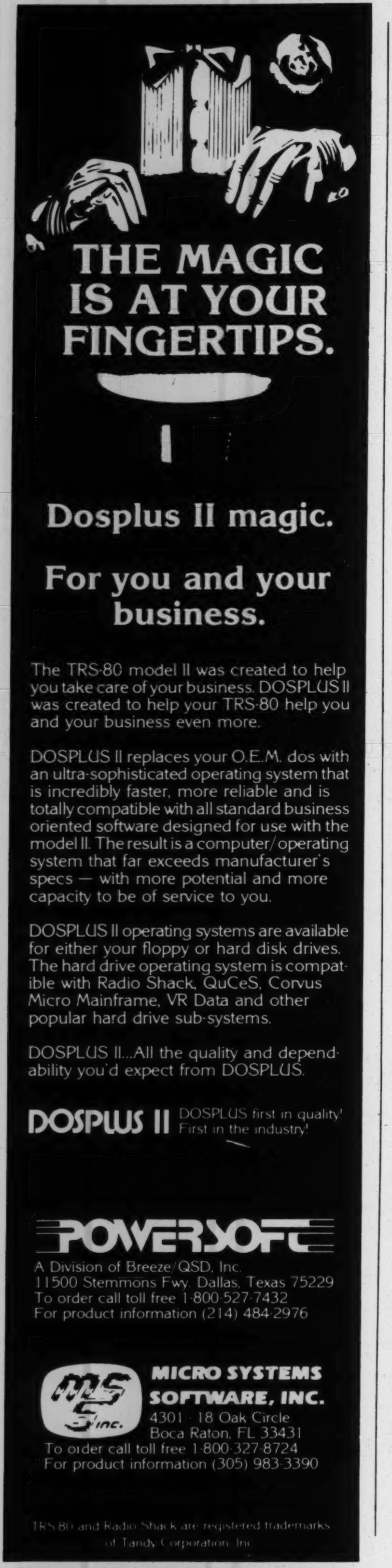
At first it may appear that newness and relevance are opposites. Not necessarily! An idea can have both characteristics. However, it is likely that ideas that have a high degree of newness are less likely to be relevant. Conversely, the most relevant idea is to do again what was done last time, which is not new at all.

Accuracy

The idea evaluation process also has measures that determine its value. The first of these is the inherent accuracy of the process. Psychologists have defined Type 1 and Type 2 errors. A Type 1 error is the acceptance of a bad idea, and a Type 2 error is the rejection of a good one.

Our example did not illustrate the accuracy problem, as we *defined* a correct answer as one that passed the two tests imposed by the evaluation section of the program. In a life situation, mistakes occur frequently, and the perfect evaluator is difficult or impossible to find. This section is created by developing a model of the environment in which the idea must survive, and no model of the environment is perfect. Those that are the most nearly so are the most useful for evaluation purposes.

Good examples of useful models are scientific laws. Any idea that violates the law of conservation of energy is probably not worth further consideration. Another useful law is the second law of thermodynamics which rules


THE MAGIC IS AT YOUR FINGERTIPS.

Dosplus II magic.

For you and your business.

The TRS-80 model II was created to help you take care of your business. DOSPLUS II was created to help your TRS-80 help you and your business even more.

DOSPLUS II replaces your O.E.M. dos with an ultra-sophisticated operating system that is incredibly faster, more reliable and is totally compatible with all standard business oriented software designed for use with the model II. The result is a computer/operating system that far exceeds manufacturer's specs — with more potential and more capacity to be of service to you.

DOSPLUS II operating systems are available for either your floppy or hard disk drives. The hard drive operating system is compatible with Radio Shack, QuCeS, Corvus Micro Mainframe, VR Data and other popular hard drive sub-systems.

DOSPLUS II...All the quality and dependability you'd expect from DOSPLUS.

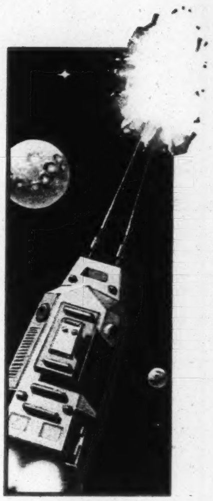
DOSPLUS II DOSPLUS first in quality! First in the industry!

POWERSOFT
A Division of Breeze/QSD, Inc.
11500 Stemmons Fwy. Dallas, Texas 75229
To order call toll free 1-800-527-7432
For product information (214) 484-2976

MICRO SYSTEMS SOFTWARE, INC.
4301 - 18 Oak Circle
Boca Raton, FL 33431
To order call toll free 1-800-327-8724
For product information (305) 983-3390

TRS-80 and Radio Shack are registered trademarks of Tandy Corporation, Inc.

CIRCLE 272 ON READER SERVICE CARD



STARJUMP

StarJump is an exciting, real-time game of interstellar conflict. Guiding one of the dozen different ship types, you must face the dangers of marauding enemy warships, tenacious planetary defenses, and deadly space storms in your quest to conquer worlds. Through decisive action a captain may lead his team to universal conquest. For one or more players on CP/M or multi-terminal MP/M systems.

Requires 48K CP/M or MP/M
StarJump: $60.00

**NEMESIS/
DUNGEON MASTER**

Modeled after Dungeons and Dragons,* Nemesis places you in a world populated by more than 200 different kinds of monsters, all of whom believe you to be an intruder to be devoured . . . a world of ten levels of dungeons beneath a castle, each increasingly dangerous to explore . . . a world of constant growth of your character to combat the increasing powers of evil. Nemesis runs in real time.

Requires 48K CP/M and cursor addressing.
Nemesis: $45.00
Dungeon Master (an add on to create your own dungeons): $40.00

ANALIZA II

Analiza II, an artificially intelligent computer entertainment, lets you emulate visits to the psychiatrist. You are the patient, your computer is the Doctor. It coordinates each session and asks you questions based on your responses. You will interact with your computer as though it is a living, breathing, bill collecting, gossiping, questioning, all too human psychiatrist. Analiza II is the most "intelligent" program of its kind.

Requires 48K CP/M
Analiza II: $50.00 (source code $50.00 additional)

ENTERTAINMENT

FOR CP/M

SuperSoft®

FIRST IN SOFTWARE TECHNOLOGY P.O.Box 1628 Champaign, IL 61820 (217) 359-2112 Telex 270365

Japanese Distribution: ASR Corporation International 3-23-8,
Nishi-Shimbashi, Minato-Ku, Tokyo 105, Japan Tel. (03) 437-5371, Telex 0242-2723

**Dungeons and Dragons registered trademark of Tactical Studies Rules.
CP/M is a registered trademark of Digital Research.*

CIRCLE 346 ON READER SERVICE CARD

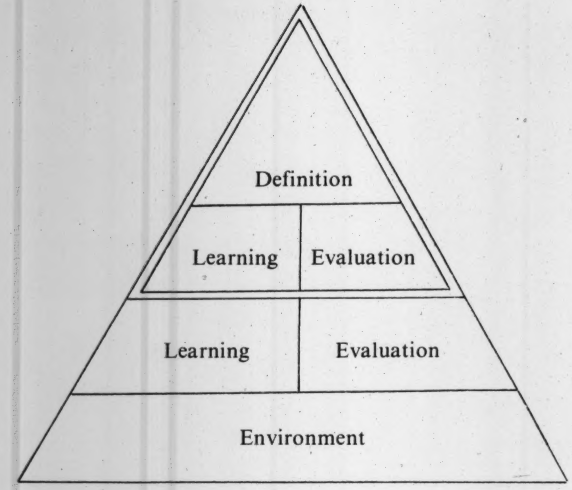


Figure 3. Generalized model of a nested creative process.

out all perpetual motion machines. The laws of science are so powerful that sometimes the idea derives from the law, being the only possible idea that is also consistent with the law. The elliptic trajectory of a satellite about the earth can be determined by finding that trajectory which is simultaneously consistent with conservation of energy, conservation of angular momentum, and the inverse square law of gravitation.

Speed and Cost

A second measure of the evaluation process is speed and cost. It is sometimes time consuming and expensive to evaluate an idea. Consider the company that introduces a new product only to see it fail in the market. Ford spent millions on one of the most publicized failures in American business, the Edsel. Yet, there are ways to reduce both time and cost.

Evaluation questions should be asked in an optimum sequence. The first questions should be the least expensive or time consuming and, upon application, have the highest probability of rejecting a poor idea.

But a cheap test which commits too many errors is costly in the long run. It depends on the situation whether Type 1 or Type 2 errors are the more costly. Rejecting a good idea increases the cost of idea definition, and accepting a poor one increases the cost of evaluation. Probably the best tests to have early are inexpensive and cull out the clearly poor ideas, but are more likely to accept a poor one than reject a good one.

A key responsibility of the evaluation section is to provide data to the learning section. Our example used only positive feedback; it updated the learning section only for successful trials. A more sophisticated evaluator might update with negative information. Had the example done so, it would have found a way out of the over-learning trap. A still more sophisticated one might inform learning which features of the idea are good and which are imperfect.

> **Many believe that the computer is able to aid creativity, but is unable to do the whole job.**

The Environment

Upon completing evaluation, the idea passes to the environment, the final arbiter of the goodness or badness of the idea. The idea either lives or dies in the environment.

In the example, the environment was represented by the user of the program. The environment varies depending upon the nature of the idea. For the Edsel, the environment was the American auto buying public. For the artist, the environment is the set of people who decide when and where his works will be collected and displayed. For the scientist the environment is other scientists who test his theories against their own experiments. If people make up the environment, their actions count more than their opinions. The corny, irritating TV commercial may not appear to be creative, but if it sells toilet paper . . .

In some cases, the objective of an evaluation process is to establish whether the idea has sufficient merit to be passed on to another level of evaluation. The descriptive triangle in Figure 2 may be redrawn as in Figure 3, in which the three elements of one process (definition, evaluation, and learning) are viewed within the context of a larger process. The idea evaluation process in one stage simulates the idea evaluation process in the next, and so on for several stages in the process if necessary.

Information from the environment also passes to the learning section of the process. The learning section receives information from two sources, the evaluator which indicates whether the idea was perceived to have merit, and the environment which provides the actual result.

By accumulating this information, the learning section becomes a storehouse of possibilities as well as historical data on what works, what doesn't, and how it does it. Learning provides the data necessary for the development of models to be used by the evaluation section and the raw materials for the idea definition section of the program.

Breaking the creative process into three elements illustrates three distinctly different possible applications of computer power. The three elements are distinct in how the computer must be programmed, and we have seldom seen the computer applied to all three within the same problem. Yet, many examples show the use of the computer for one of the three. The remaining two require human intervention. As a result, many believe that the computer is able to *aid* creativity, but is unable to do the whole job.

Let us look at a few examples where the computer is used to support one of the three elements. In idea definition, the computer has been used to create words for the purpose of naming proprietary drugs and chemicals. The computer is programmed to print long lists of words using various rules of length and sound (such as ending with an "ex"). A human scans the lists to select those worthy of further consideration based on whether they convey the right feeling or leave the right impression.

BENEATH APPLE MANOR

special edition
©G.C. GARCIA '82

the
classic
fantasy
game
for the
Apple II
by
Don Worth

now in
hi-res

can *you*
find the
golden
apple?

Don Worth, the co-author of Beneath Apple DOS and Bag of Tricks, has returned to his first love — fantasy adventure! This special edition of the game that Softalk magazine labels a "classic" is far better than the popular original — with faster reaction time, high resolution graphics, sound effects, a deeper dungeon, and more monster types and magic items. Lots of adventure at a reasonable price . . . $29.95.

Runs on any 48K Apple II or Apple II Plus with one disk drive.

QS QUALITY SOFTWARE 6660 Reseda Blvd., Suite 105, Reseda, CA 91335 • (213) 344-6599

CIRCLE 256 ON READER SERVICE CARD

The computer has been used extensively for idea evaluation. As an engineer, I used the computer to design ballistic missiles. Selecting various parameters of size and weight, I would "fly" the missiles on the computer until I found the combination of factors that yielded a missile to go the distance which carried the maximum payload. The use of the computer in evaluation is extensive in engineering design as the laws of science are relatively simple to program.

As a storehouse of information, the computer has no equal if the information can be recorded by symbolic means. The computer is thus a strong contributor to the learning part of the process. Computers are used today to maintain libraries of information which can be retrieved in seconds. Applications are found in law, where the computer is used to find citations for legal questions.

It is apparent that the computer is theoretically capable of being programmed to accomplish all three parts of the process. One would expect it to be applied first where it is simplest to do so. So, where one of the three elements is capable of being programmed, we can expect it to be done, with the human required to cover the rest.

That which the human performs is likely to be the more complex part of the overall task. But for the computer to be called creative, it will have to be programmed to perform all three within a single problem. Problems in which all three elements can be programmed are likely to be relatively trivial for some time to come. However, part of this theory says that complex systems evolve over time, and such is likely to happen in this case as well.

A program that merely provides the logical consequence of a set of rules is not generating creative solutions.

Difficulties

So let us look at the three elements again to identify the difficulties which need to be overcome to achieve more broadly useful results.

One difficulty lies in idea definition where we ask the computer to create options that are both novel and useful. A program that merely provides the logical consequence of a set of rules is not generating creative solutions. In the series example, we used randomness to provide an element of newness in the algorithms which were generated. At the same time all algorithms were generated within very definite limits of what was possible using the operators and operands which were allowed and within the length of algorithms that were created. This assured some probability that the algorithms so generated had a chance, albeit a small one, of satisfying the criteria for a solution.

TALK
TO
SANTA
9-5
campbell

"I'm not naive enough to believe any Santa Clause has a list of all the kids in the world. He obviously has us in a computer."

There is good reason to believe that enforced randomness is a useful tool in option creation. If we study the history of science we find numerous famous and creative discoveries which came about as a result of chance events. Quoting from Judson's *The Search for Solutions:*[1]

> "Pasteur or one of has assistants innoculated some chickens with a cholera culture from the wrong jar — it was old. The chickens got sick, but then recovered. Curiosity piqued, Pasteur innoculated the chickens again with a fresh culture known to be virulent. This time the chickens didn't even get sick."

Judson recounts several other stories where chance played a significant role, including the discovery of radium by Curie and of x-rays by Roentgen. And there are many others.

Randomness

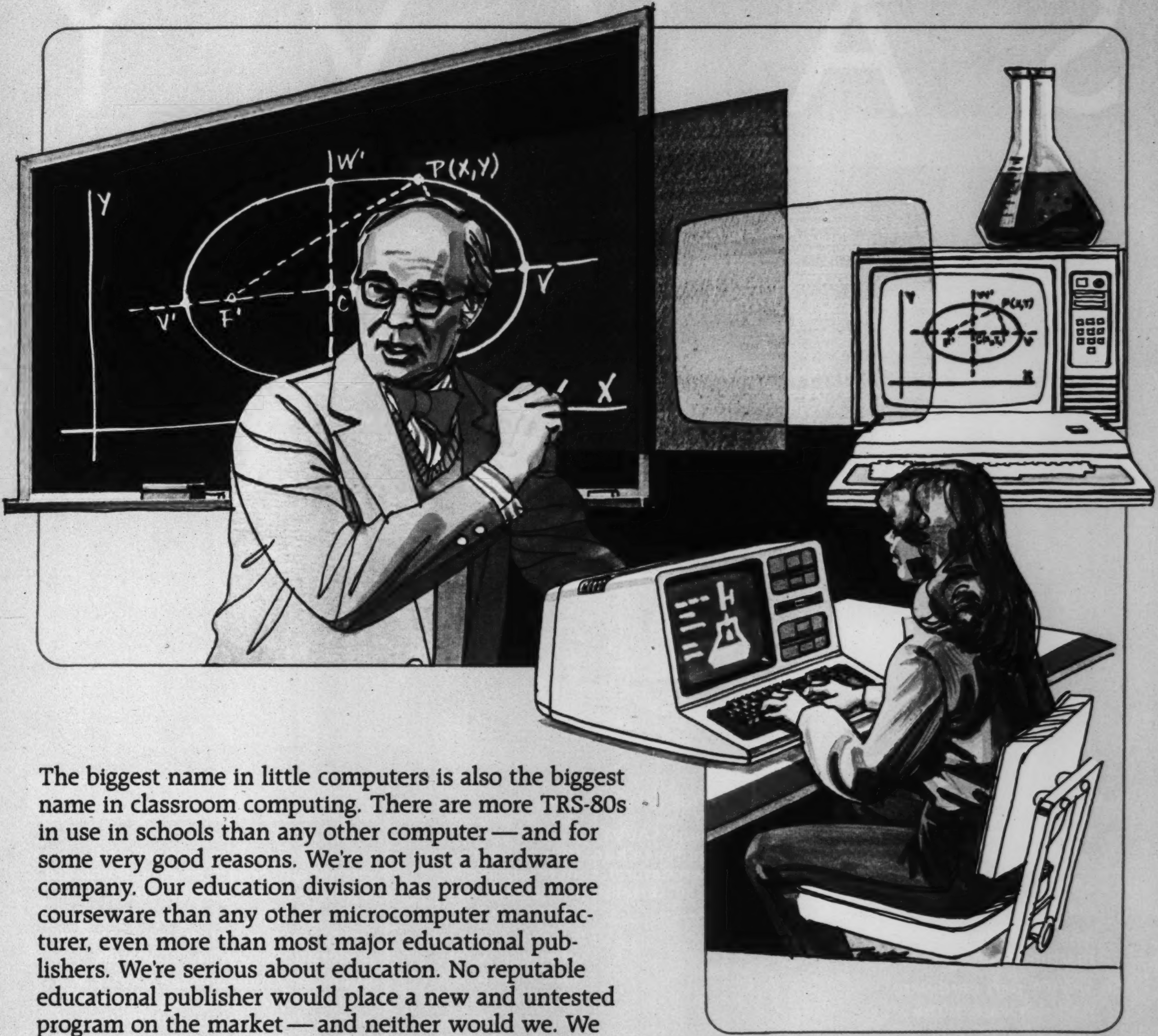
Yet another example of randomness in the creative process is the sexual reproduction of complex living things. That two sexes are required, each providing some of the information needed to create a new life, demonstrates the principle of controlled randomness. An offspring is never an exact copy of either of the parents, yet it is sufficiently like them to have a high probability of survival in the environment.

Complex living things are constantly recreated. All parts of the living thing are changed slightly, with no intention necessary as to the merit of the changes. The interaction of the living thing with the environment determines whether the changes were for the better, represented by whether it participates successfully in the next reproduction cycle.

Non-sexual reproduction does not provide the mechanism for offspring to have variations and yield a high probability of survival at the same time. Differences which occur through mutation have a low probability of survival, and exact copies do not provide for the evolution of the species in the face of a changing environment. This explains why non-sexual reproduction is limited to simple organisms, where multiple billions of them are created giving the mutation method a chance to work.

But if some randomness is necessary for the creative process, too much can kill it. It is an old argument that a computer typing random letters will type all the works of Shakespeare if given enough time. Enough time com-

Reading, Writing, and TRS-80®



The biggest name in little computers is also the biggest name in classroom computing. There are more TRS-80s in use in schools than any other computer — and for some very good reasons. We're not just a hardware company. Our education division has produced more courseware than any other microcomputer manufacturer, even more than most major educational publishers. We're serious about education. No reputable educational publisher would place a new and untested program on the market — and neither would we. We maintain an extensive field test program for all our classroom products. If they don't measure up, we don't put our name and our reputation on them. And they don't make it into your classroom. Our service and support organizations are second to none. And they're company-owned and company-operated — nationwide. If you're serious about computers in your classroom, ask a school that owns a TRS-80. And then visit a Radio Shack Computer Center or one of our stores near you. Or call 817-390-3302 for the name of our full-time educational sales coordinator in your area.

Radio Shack®

The biggest name in little computers™

A DIVISION OF TANDY CORPORATION

CIRCLE 291 ON READER SERVICE CARD

INTRODUCING

SAVVY™

. . . the PERSONAL LANGUAGE™ system that mirrors your commands using your own words!

What SAVVY is —

- SAVVY is a miraculous new information handling system.
- SAVVY is an automatic database management system.
- SAVVY is a new level of machine intelligence.
- SAVVY, part hardware, part software, is the beginning of truly "Personal Computing".
- SAVVY comes with: General Ledger, Accounts Receivable, Accounts Payable, Payroll, Mailing List, Document Writer and Inventory Control.

Trademark: SAVVY, Robot Programmer: Excalibur Technologies Corporation.

Personal Language: SAVVY Marketing International.

SAVVY
PERSONAL LANGUAGE

What SAVVY does —

Through SAVVY, you and your computer talk to each other in your own natural, conversational English (or Spanish, or French, etc.).

It learns from you what you want done in your own personal language.

Once SAVVY learns your language it can create any file you wish. Input, output, additions, changes and deletions are arranged for you.

SAVVY's "Robot Programmer" has been trained to write 100% of the programs needed to manage your database information.

SAVVY runs CP/M™ and Apple DOS.

What YOU discover —

You'll discover that SAVVY recognizes your personal words, even if misspelled, or even if you use a phrase never used before!

SAVVY continues to grow through use to become better and better at understanding your commands.

Eventually, you will see SAVVY as a mirror to your own way of thinking and working. It is a re-definition of "user-friendly".

SAVVY, it's the first system that truly means "personal computing".

SAVVY is like no other system on earth.

SAVVY cost $950.

Seeing is believing. SAVVY is on display at selected computer retail locations. Call for the name of your nearest dealer.

CP/M is a trademark of Digital Research Corp.

Apple is a Trademark of Apple Computer Inc.

CIRCLE 305 ON READER SERVICE CARD

100 South Ellsworth Street, 9th Floor, San Mateo, CA 94401 (415) 340-0335

SAVVY
MARKETING INTERNATIONAL

putes to be longer than the universe has been around. This means that randomness can not be applied to create a complex result from scratch. The total project must be divided in some way, and randomness applied to each part with a suitable mechanism to evaluate and learn. It is then possible that something useful will evolve over time.

Measures of Performance

The evaluation section also offers considerable challenge. If evaluation can be based on well defined measures of performance, the task may be relatively easy. Such is true where one can apply the laws of science, or in game playing where the measure of performance is *win* or *lose*.

A large part of developing an effective evaluation section is the ability to specify what constitutes progress toward a goal. The advantage of having this measure is illustrated in Hans Berliner's Backgammon playing computer program.[2]

He employs a measure of performance for each move that permits the program to select those which improve the strategic position of the computer. His evaluation process does not wait until the game is over to determine measures of value, nor does it solve for all possible implications of each move.

A greater challenge lies where there are no programmable measures of performance. This occurs where the environment is too complex to permit a valid simulation of its behavior, for example, where the idea is a new product and sales are subject to whim and fashion. Evaluation is difficult where the values of performance are highly judgmental, as with art and music.

But it is here where the possibilities of computer learning are the most intriguing. It may be possible to analyze human judgments through trial and error, using large numbers of interactions with humans. The computer would offer ideas and the humans would indicate approval and disapproval. Computer learning would decipher the humans' rules of what is good and what isn't.

The learning section of the process is where the computer should excel. Consider the very use of the term "memory" for computer storage, a holdover from the '50s when computers were sometimes called "giant brains."

The problem with computer memory is not that it is limited; with technology improving indefinitely, the amount of storage available will boggle the mind. The real need will be to find the information that you want. But this problem is not insurmountable. Techniques for searching through billions of bytes of data using key search words or patterns exist. This includes the use of inverted files and relational databases.

The Future

This is not to minimize some real problems that will continue. The computer excels in storing symbols, but not pictures, three dimensional objects, or the human voice. Because of limitations, the storage of these items employs techniques which minimize the amount of storage required. But these techniques make the *use* of the data more complex. With the availability of large cheap storage, it will be possible to use techniques that do not interfere with the use of the information.

Much of the so-called education in creative thinking focuses only on removing inhibitions to the idea generation process, certainly a useful contribution but by no means the whole story.

No one can predict the future with certainty, but I predict that the computer will eventually be used in areas that involve real creativity. Given difficult problems, it will surpass the ability of the human to perform the same creative task. The computer may give the appearance of "thinking" but whether it does is not important. What it will do is make use of the same principles that are employed by all creative systems, human and other.

This article has applied the principles of the creative process to the use of computers. Two other applications of these principles are equally interesting, but alas, are subjects of other articles.

One is *individual creativity*. We have made passing reference to this subject, but much more could be explored. For example, it appears that an individual passes through three stages as a creative person. The first is the naive stage, in which the idea definition process is active and uninhibited, but where the evaluation process is undeveloped. The third is the overlearned stage in which the evaluation process dominates, and learning has ceased to add new value.

The middle stage is the most creative, in which the three elements are in balance.

We need to discover means to enhance and lengthen the middle period. Much of the so-called education in creative thinking focuses only on removing inhibitions to the idea generation process, certainly a useful contribution but by no means the whole story.

The second subject is *organizational creativity*. Again, looking at the creative process, three distinct elements provide the key for analysis. We see the three working within the organization as separate entities, departments, or individuals. For example, the engineering department develops an idea for a new process and the treasurer says "no."

By understanding the process one can discover whether the various forces in the organization are strong and in balance, and whether the conflict that inevitably results is healthy or damaging. The organization learns through the collective experience of its members, and knowledge is maintained through its principles, policies, records, and procedures.

Organizations can easily become rigid, a parallel to the "overlearned" condition, and when faced with a changing environment, will eventually die. An organization that retains its creative flexibility, can adapt to the changing environment and survive. ☐

Footnotes

[1] Horace Freeland Judson, *The Search for Solutions*, Holt, Rinehart and Winston, New York, 1980, p. 71.

[2] Hans Berliner, "Computer Backgammon," *Scientific American*, vol. 242 n. 6, June 1980.

"Merry Christmas, terminals!"

Experience, Experiments and Intelligence

Don Berry

The on-going discussion of Artificial Intelligence (and hence Real Intelligence) has become so hopelessly mired in ambiguity and self-contradiction that I am beginning to dread the appearance of ever more writing on the subject.

By now it is clear that what emerges from this game is more intricate software and more elaborate circuitry. If this is our goal, then we can (and should) dispense with the metaphysical mumbo-jumbo that accompanies it. No one doubts that we can continue to create more complex devices to handle data in more complex combinations. That's what we (the Aristotelian cultures) are good at.

But it must be obvious to any reasoning person that it is a hopeless and foolish task to apply rigorous logical thinking to a series of word-elements that have no definite meaning in our language. Words such as "thought," "consciousness," and "awareness," are vague, connotative generalities in English. This is partly because of the fundamental nature of English, and partly because the amount of energy we have devoted to investigating such ideas is negligible, at least in comparison with other cultures.

It has been our cultural bent in the past few thousand years to devote our attention almost exclusively to manipulation of physical elements. Our knowledge of "mind," "consciousness," and so forth, is at the witch doctor level, and everyone knows it.

Our mechanical proclivities lead to an unfounded (and virtually unquestioned) assumption, best stated by our current Aristotelian spokesman Carl Sagan. In his own study of consciousness he sets forth (as axiomatic) that consciousness is a by-product of brain activity.

Well, OK. Unfortunately, there does not exist a single shred of experimental evidence to support that assumption. It is merely the naive expression of a cultural bias in favor of mechanical explanations.

It is a somewhat infantile hope—and also contrary to the spirit of scientific investigation—to believe that if we can just get things complicated enough we will arrive at some simple insight into the nature of intelligence. It reeks of the superstitious mentality which will not consider any alternative that contradicts its own tightly held assumptions.

It seems to me that the roots of this hairy confusion about intelligence lie in these elements:

1. The cultural assumption that intelligence is the by-product of physico-chemical activity in the brain.
2. The unusable vagueness of the "living" languages in describing interior functions.
3. Lack of true experimental investigation of the nature of consciousness. AI is the futile attempt to duplicate something without any real knowledge of what the "something" is.

It is the primary faith of Western science, and the foundation of the experimental method, that experience is to be preferred over theory. "Experiment" originally meant "experience," and still does in many Latin-based languages.

However, all experience, by its nature, consists of the interaction between two elements, the experiencer and the thing experienced. This interaction is the only thing which gives meaning to the notion of experience. We have chosen to exclude the experiencer part of the equation, in the hope of reducing "subjective" error, personality factors, etc.

This exclusion has indeed been very useful, but its utility has limits. One cannot arbitrarily exclude 50% of an event and hope to arrive at an intelligent assessment of that event.

One would have thought that the discoveries of quantum mechanics and their experimental verifiability would have demonstrated the limits of this so-called "objectivity." The Schrodinger wave equations demonstrate without ambiguity the necessary interaction between the observer and the observed.

It is the clear statement of the Schrodinger equations, and, indeed, quantum theory in general, that this phenomenon we call "world" comes into being through the interaction of the "subjective" and "objective," and not in any other way.

This would, of course, come as no surprise to the Buddhists, Vedantins, and Yogis, who have been saying the same thing in very precise terms for a couple of thousand years.

Don Berry, President, Strawberry Software, Inc., P.O. Box 743, Vashon Island, WA 98070.

How about a nice vacation on the beaches of France – for just $39.95?

At SSI, we think that our latest software for the Atari,® TRS-80® and Apple® — BATTLE FOR NORMANDY™ — is more than a great strategy game. We think of it as a great vacation package. After all, we are whisking you off to the northern coast of France for 25 days of fun and excitement (June 6 to 30, 1944) — all for just $39.95!

Of course, we're not promising peace and quiet. There is a war going on, you know....World War II!

We'll be taking you to the beaches of Normandy in style. Not on a mere jumbo 747 or an ocean liner, but an LCI (that's Landing Craft Infantry). Let's see the Joneses top that!

Like any good traveler, you need to plan ahead. What's the weather going to be like out there? Rough and stormy? Calm and gorgeous? It's hard to say, so you'd better be prepared for all kinds.

How about supplies? Well, we're a little tight on luggage space, so you'll have to juggle among the things you really need: fuel, general, and combat supplies.

How about some friendly sea bombardment to let the natives know you're coming? After all, you don't want trouble once you hit the beaches. The natives are a bit hostile at first, and a little naval artillery fire really helps to loosen them up.

And our service? Have we got good service — and plenty of it! Whole divisions and regiments of infantry, paratroopers, tank units, and commandoes are at your every beck and call. We do have to apologize for their different leadership and combat ratings. It's so hard to get good, consistent help these days.

You want sightseeing? You've got sightseeing! Nice historical towns like St. Lo, Cherbourg, and Caen — which you just have to take in (or take over, as the case may be.)

We know there's a lot that goes into preparing for a vacation, and we don't want you to worry about the details one bit.

SSI is one of the most advanced companies around because we're totally computerized. Our great computer program takes care of all the dirty work so all you do is enjoy. After all, you're on this trip for the fun and games, not work. And if you have a hard time finding friends to play with, who needs friends? You can play solitaire against the computer any time.

For complete details see the travel agent at your nearest game or computer store today!

STRATEGIC SIMULATIONS INC [illegible]

If there are no convenient stores near you, VISA and M/C holders can order direct by calling 800-227-1617, ext. 335 (toll free). In California, call 800-772-3545, ext. 335. To order by mail, send your check to: Strategic Simulations Inc, 465 Fairchild Drive, Suite 108, Mountain View, CA 94043. (California residents, add 6.5% sales tax.)

Available in 32K cassette or 40K disc for the Atari® 400/800, 16K cassette for the TRS-80® Level II, Models I & III; and 48K disc for the Apple® II with Applesoft ROM card. Please specify which version when ordering.

WRITE FOR A FREE COLOR CATALOG OF ALL OUR GAMES.

CIRCLE 341 ON READER SERVICE CARD

Apple is a registered trademark of Apple Computer Inc. Atari is a registered trademark of Atari Inc. TRS-80 is a registered trademark of the Tandy Corporation.

FUN IN THE SUN

It's 110° in the shade. And you're about to have the time of your life in the most exciting road race ever created. BAJA BUGGIES™ by GAMESTAR. For the ATARI® 400/800™ Home Computers.

It's just you and your super-charged machine against some of the best race drivers in the world. "Legends" like A.J. Cactus, Mario Sandduni, and Parnelli Pothole. Each determined to push you to your limits, race after race.

BAJA BUGGIES™ breaks new ground with absolutely stunning visuals. Amazingly realistic racing sounds. And all the thrills, spills and excitement of real road racing. As only sophisticated ATARI® 400/800™ Home Computer entertainment can.

So climb into your buggy, put on your helmet and get set for a little fun in the sun—BAJA BUGGIES™ by GAMESTAR. Look for it at your nearest ATARI® retailer.

GAMESTAR

WE BRING OUT THE STAR IN YOU.

1302 State Street, Santa Barbara, CA 93101 (805) 963-3487

CIRCLE 219 ON READER SERVICE CARD

© 1982 GAMESTAR, Inc. All Rights Reserved

Atari and 400/800 are trademarks of Atari, Inc.

Guest Editorial, continued...

It is not generally understood in the West that these observations by Eastern thinkers are based on experimental evidence. That is to say, their results are duplicatable by following the same experiential procedures. Since this is the criterion we use to validate our own experimental results, it is a little obscure why we choose to ignore it in evaluating theirs. It has been our amusing habit to assume that we can make accurate evaluations on the basis of our convictions, rather than by duplicating their experiments.

The Indian experimenters, however, have had at least one tremendous advantage over the West. That is the use of a mathematically precise language to describe their area of investigation.

The Sanskrit language has not "evolved" in the same sense that languages such as English have. It is, rather, a "constructed" language, which has been designed to express accurately the nature of conscious experience. In this it more closely resembles mathematical symbolism than English.

> ***Unquestionably the greatest impediment to useful scientific investigation in any culture is the rigidity of that culture's conditioning.***

There are in Sanskrit, for example, about 30 words describing precise levels of conscious function, all of which would (feebly) translate into English as "mind." It reminds one of the Eskimo vocabulary describing the many varieties of snow which we scarcely even perceive because we don't care that much about it.

I am not suggesting by this that we should trade in our three-piece suits for *dhotis* and go live in *ashrams* until we get it straight.

I am suggesting, however, that the overweening arrogance created by our mechanical accomplishments has blinded us to the fact that we are not the only intelligent human beings on this planet, and that others may well have systematically explored areas which baffle us and our methods, just as we have explored areas which baffle them.

Unquestionably the greatest impediment to useful scientific investigation in any culture is the rigidity of that culture's conditioning. We need to step a little outside our own conditioning to discover anything at all, much less something as fundamental as the nature of consciousness.

Since we already "know," with Carl Sagan, that consciousness is a by-product of brain activity, we are prohibited from examining the alternative. It is the unanimous conclusion of Indian experimenters that such is not the case. It is their conclusion that the brain is a marvelously complex and subtle mechanism for handling sensory and mental data, but is not, in itself, the source of conscious awareness.

In short, it is the opinion of those who have most thoroughly investigated the issue that the "subject" side of experience (that is, consciousness, awareness) is complementary to, but not derivable from, the "object" side (that is, physical phenomena).

Perhaps it would be worth looking into the researches of those who have traditionally investigated interior states for some insight into our own confusions. ☐

we are commodore VIC experts!!

(we have the lowest prices—PLUS!!)

- We sell and service only VIC-20 Computers!
- We have more in stock merchandise than anyone!
- We give the best service in the USA!
- One day delivery express mail!
- We handle warranty and service within 24 hours!
- We give 15 day free trial on all merchandise!
- We mail refunds within 24 hours after receiving returns!
- We have over 500 programs—270 educational tapes—programming aids—business—home—games!
- We mail free catalogs—specify category you desire!
- We accept Visa and Mastercard—plus we ship C.O.D.!
- We are the first to offer new "in stock" items!

"BUY YOUR COMPUTER'S CHRISTMAS PRESENT NOW!"

1. TRACTION-FRICTION LINE PRINTER This new COM-STAR deluxe printer, prints 8½" x 11" full size letter quality single, roll or fan fold paper, labels and etc. Impact dot matrix bi-directional 40, 66, 80, 132 columns. Includes interface cable that plugs direct into the VIC-20 computer, no other costly interface is needed. List $599.00 — Sale $399.00.

2. UP TO 60K EXPANSION MODULE Aero Space designed—6 slot—add up to 6 cartridges—switch select any program. Start and strop any program with reset button—not necessary to remove cartridges or turn off compûter, saves time, television and computer (one year warranty) List $149.00 — Sale $89.00.

WE LOVE OUR CUSTOMERS
(our prices prove it)

PROTECTO
ENTERPRIZES (FACTORY DIRECT)
BOX 550, BARRINGTON, ILLINOIS 60010
Phone 312/382-5244 to order

CIRCLE 284 ON READER SERVICE CARD

From Burn-Out To Born-Again

Witold K. Urbanowicz

'Twas the week before Christmas and all through the house...You get the picture. I had just come in from walking the dog. It was late and, more important, the house was quiet. The rest of the family was tucked away for the night. So was the Atari 800.

There it sat neatly stacked on the living room shelf. Next to the cassette player lay operating manuals along with little boxes labelled *Bio-Rhythms* and *Star Raiders*.

Vacationing friends had kindly consented—after a few subtle hints from my nine-year old son—to leave their personal computer in our care. So for the past week, our living room had been an extraterrestrial battle-zone. The walls echoed with the sounds of hyper-space thrusters, photon-lasers and thermonuclear explosions. My wife and I kept our distance. She could not stand the noise and the violence. For me, there were other reasons.

I had spent the better part of my early adult life programming, analyzing, and trouble-shooting commercial computer systems. As I looked at the compact console sitting there on the shelf, my mind went back about ten years.

I could still remember being ushered through a door into a room about the size of a basketball court. It was like walking into the future. Inside this air conditioned, climate controlled world sat the company's four computer systems, along with their respective disk drives, tape drives, printers, and various other peripherals.

I was led past rows of lights flashing on main frame panels. Long lines of tape drives danced back and forth. Disk packs whirled secretively inside their stacked enclosures. Printers spewed out reports by the truckload. Adrenalin began racing through my own system at a speed, I was certain, approaching that of the computers themselves.

Each of the four computer systems had a nickname. "Poppa Bear I" and "Poppa Bear II" were twin systems with individual core capacities in the megabyte range. These were used to run the major financial systems of the corporation. "Momma Bear", weighing in at 512K, was devoted to teleprocessing. It communicated with computers across the country. "Baby Bear", a little 48K three-partition machine was used nights for the smaller systems, but during the day was dedicated to the programming and systems people for compilations and testing. "Baby Bear" was to be my own personal computer for the next few years.

As the years passed, the software became more complex, requiring more and more core as well as faster and faster processing speeds. My skills and responsibilities were naturally upgraded to keep up with the larger and more complex applications. As deadlines became more critical and the problems more intricate, the pace became absolutely frantic. Murphy's Law reigned supreme.

"Baby Bear" became a dim memory and my family life was in danger of becoming the same. By now it had become a frequent occurrence for me to work months on end at all hours in order to bring a project in on time. For the most part, the results of this effort—the *bottom line*— were meant for someone I would never meet in a city I would never see.

Several times after the project had been completed, I asked whether it was serving the intended users well, only to discover that the project had been scrapped or that the reports were piling up somewhere in a storeroom in unopened boxes.

About the third or fourth time this happened, I was sitting in the computer room at five in the morning. I had gone about 72 hours without sleep. It had been months since I had seen the kids. I felt as gray and flat as the tile floor beneath my feet. It was then that I decided to leave the field.

When I left, I never wanted to see another computer in my life. Any thrill or satisfaction I may have felt in the early part of my career had not just disappeared. It had been slowly ground out of me.

All these thoughts and images ran through my mind in a matter of nanoseconds that evening as I stared at the Atari on the shelf. It seemed to be waiting for me. I wondered if I had put enough distance between myself and

---

Witold K. Urbanowicz, 135 Eastern Parkway, Brooklyn, NY 11238.

MACHINE-LANGUAGE DISK I/O & OTHER MYSTERIES, TO HARNESS THE POWER OF DISK DRIVES.

The best and most complete book on TRS-80 Model I and Model III disk I/O available.

"Machine-Language Disk I/O & other mysteries" by Michael Wagner. Volume 5 of the popular ". . . and other mysteries" series published by IJG.

More than 190 pages of information and discoveries on the subject of disk I/O for the beginner and expert alike, using Z-80 Assembly Language to directly control the TRS-80 Model I and Model III disk drives and interrupt systems. With this book anyone can become a disk I/O "expert", and make more efficient use of disk space, or to write his or her own "full blown" disk operating system!

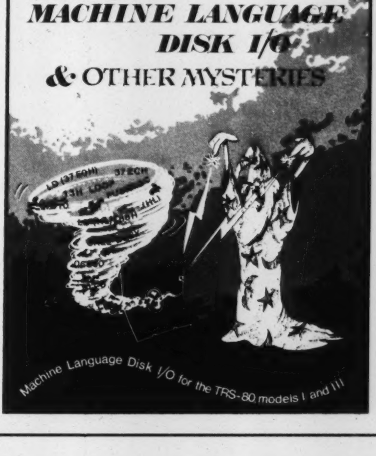
For the beginner and old pro'.

Machine-Language Disk I/O & Other Mysteries is packed with source code and flow chart illustrations for every function and operation described. And the source code for two complete disk I/O driver routines, one for the Model I and one for the Model III, are also included for "instant" access to your floppy drive systems.

Plus, the source code for a small disk operation system (S/OS) is included as a bonus. This S/OS contains all of the routines described in the book and shows how all of the disk I/O and interrupt functions should be incorporated into a working system.

On machine language disk I/O.

Machine-Language Disk I/O & Other Mysteries explains what the floppy drive system is all about, what Tracks and Sector are, the Western Digital Floppy Disk Controller 1771 and 1793 chips, read/write access, reading a selected drives' status, how to test and make sure a disk is in a drive or if a drive is on the system (on-line), the Head Restore command, the Head Step and Seek commands, the "Force-Interrupt of function" command, the Read Address command, the Read Track command, the Write Track (FORMAT) command, the Read Sector command, the Write Sector command, Post Non-Maskable-Interrupt Processing for the model III, and much more.


TRS-80 INFORMATION SERIES · VOLUME V

Michael J. Wagner

MACHINE LANGUAGE DISK I/O & OTHER MYSTERIES

Machine Language Disk I/O for the TRS-80 models I and III

On TRSDOS file I/O

and most TRSDOS-like operating systems, Machine-Language Disk I/O & Other Mysteries explains; what a disk file really is, what records are and how they're stored on the disk, creating a file, performing Direct Record I/O, performing Single Byte I/O, closing & killing files; error processing and TRSDOS error codes with their meanings, and much more.

Plus many other handy programs, routines, and revelations are included. Such as a TRSDOS error message displayer, a disk formatter program, a program to calculate a password for a given encode, a object file load-format displayer, a file oriented full screen file editor, and a FULL BLOWN smart terminal program.

Machine-Language Disk I/O & Other Mysteries is a must for all programmers at just $29.95. Available at computer stores, selected B. Dalton Booksellers and independent book dealers. If your dealer is out of stock, order direct. Include $4.00 for shipping and handling. Foreign residents add $11.00 plus purchase price, in U.S. funds.

IJG
1953 West
11th Street
Upland, CA
91786 (714)
946-5805

CIRCLE 208 ON READER SERVICE CARD

TM TRS-80 and TRSDOS are registered trade marks of TANDY Corp.

© IJG, Inc. 1982

Our "almost wholesale" prices just got 2% lower.

Take an additional 2% off our listed prices, until December 24.

Have a merry computer and a happy software.

16K RAM KITS......13.95

Set of 8 NEC 4116 200 ns. Guaranteed one year.

DISKETTES

ALPHA DISKS................21.95

Single sided, certified Double Density 40 Tracks, with Hub-ring. Box of 10. Guaranteed one year.

VERBATIM DATALIFE

MD 525-01, 10, 16	26.50
MD 550-01, 10, 16	44.50
MD 557-01, 10, 16	45.60
MD 577-01, 10, 16	34.80
FD 32 or 34-9000	36.00
FD 32 or 34-8000	45.60
FD 34-4001	48.60

DISKETTE STORAGE

5¼" PLASTIC LIBRARY CASE	2.50
8" PLASTIC LIBRARY CASE	3.50
PLASTIC STORAGE BINDER w/ Inserts	9.95
PROTECTOR 5¼" (50 Disk Capacity)	21.95
PROTECTOR 8" (50 Disk Capacity)	24.95
DISK BANK 5¼"	5.95
DISK BANK 8"	6.95

NEC PERSONAL COMPUTERS

Call Alpha Byte for our low NEC prices.

ALTOS COMPUTER SYSTEMS

Call Alpha Byte for our low Altos prices.

ATARI COMPUTERS

SIGNALMAN MODEM	85.00
ATARI 800	659.00
ATARI 400 (16K)	$CALL
ATARI 810 DISK DRIVE	445.00
ATARI 850 INTERFACE	169.00
ATARI 410 PROGRAM RECORDER	75.00
EPSON CABLE	35.00
MEMORY MODULE (16K)	89.95
JOYSTICK CONTROLLER	10.00
PADDLE CONTROLLERS	19.95
STAR RAIDERS	35.00
MISSILE COMMAND	35.00
ASTERIODS	35.00
PACMAN	35.00
CENTIPEDE	35.00

INTEC PERIPHERALS RAM MODULES

48K FOR ATARI 400	199.00
32K FOR ATARI 800	85.00

PRINTERS

RIBBONS FOR MX-80	8.95
RIBBONS FOR MX-100	24.00
C-ITOH F-10 40 CPS PARALLEL	1390.00
C-ITOH F-10 40 CPS SERIAL	1390.00
C-ITOH PROWRITER PARALLEL	480.00
C-ITOH PROWRITER SERIAL	590.00
EPSON MX-80 W/GRAFTRAX PLUS	$CALL
EPSON MX-80 F/T W/GRAFTRAX PLUS	$CALL
EPSON MX-100 W/GRAPHTRAX PLUS	$CALL
EPSON GRAFTRAX PLUS	60.00
COMREX CR-1 PARALLEL	839.00
COMREX CR-1 SERIAL	859.00
COMREX TRACTOR FEED	109.00
IDS PRISM 80	859.00
IDS PRISM 80 W/ COLOR/OPTIONS	1599.00
IDS PRISM 132 W/ COLOR/OPTIONS	1799.00
NEC 8023A	485.00
NEC SPINWRITER 3530 P. RO	1995.00
NEC SPINWRITER 7710 S. RO	2545.00
NEC SPINWRITER 7730 P. RO	2545.00
NEC SPINWRITER 7700 D SELLUM	2795.00
NEC SPINWRITER 3500 SELLUM	2295.00
OKIDATA MICROLINE 80	389.00
OKIDATA MICROLINE 82A	460.00
OKIDATA MICROLINE 83A	700.00
OKIDATA MICROLINE 84	1170.00
OKIGRAPH 82	49.95
OKIGRAPH 83	49.95
MICROBUFFER IN-LINE 32K	299.00
MICROBUFFER IN-LINE 64K	349.00
MICROBUFFER 64K EXPANSION MOD	179.00

CORVUS

FOR S-100, APPLE OR TRS-80 MOD I, III

Controller,Case/P.S.,Operating System,A & T.

5 MEGABYTES	2755.00
10 MEGABYTES	3699.00
20 MEGABYTES	4299.00
MIRROR BACK-UP	700.00
THE CUSTOM APPLE	24.95

BOOKS

THE CUSTOM TRS-80	24.95
MICROSOFT BASIC FASTER & BETTER	24.95
CUSTOM I/O MACHINE LANGUAGE	24.95

APPLE HARDWARE

APPLEMATE DRIVE	287.00
SUPER CLOCK II	129.00
VERSA WRITER DIGITIZER	259.00
ABT APPLE KEYPAD	119.00
SOFTCARD PREMIUM SYSTEM	579.00
MICROSOFT Z-80 SOFTCARD	260.00
MICROSOFT RAMCARD	125.00
VIDEX 80x24 VIDEO CARD	260.00
VIDEX KEYBOARD ENHANCER II	129.00
VIDEX ENHANCER REV 0-6	99.00
VIDEX FUNCTION STRIP	74.00
M & R SUPERTERM 80x24 VIDEO BD	315.00
APPLE COOLING FAN	44.95
T/G JOYSTICK	44.95
T/G PADDLE	29.95
T/G SELECT-A-PORT	54.95
VERSA E-Z PORT	21.95
MICRO SCI A2 W/CONTROLLER	510.00
MICRO SCI A2 W/O CONTROLLER	419.00
MICRO SCI A40 W/CONTROLLER	479.00
MICRO SCI A40 W/O CONTROLLER	409.00
MICRO SCI A70 W/CONTROLLER	629.00
MICRO SCI A70 W/O CONTROLLER	549.00
THE MILL-PASCAL SPEED UP	270.00
PROMETHEUS VERSACARD	180.00
LAZAR LOWER CASE +	59.00
MICROBUFFER II‡ 16K W/GRAPHICS	259.00
MICROBUFFER II‡ 32K W/GRAPHICS	299.00
SUPERFAN II	62.00
RANA CONTROLLER	114.00
RANA DRIVES	360.00
SNAPSHOT	119.00
GRAPPLER+	145.00
7710A ASYNCHRON. SER. INTERFACE	149.00
7712A SYNCHRON. SER. INTERFACE	159.00
7742A CALENDAR CLOCK	99.00
7728A CENTRONICS INTERFACE	105.00
APPLE VISION 80-80 COL CARD	329.00
APPLE 8" DISK DRIVE CONTROLLER	549.00
HAYES MICROMODEM	289.00

MONITORS

AMBER 12"	179.00
NEC 12" GREEN MONITOR	179.00
NEC 12" COLOR MONITOR	399.00
SANYO 12" MONITOR (B & W)	249.00
SANYO 12" MONITOR (GREEN)	269.00
SANYO 13" COLOR MONITOR	469.00
ZENITH 12" HI RES GREEN MONITOR	124.00
AMDEK COLOR I	365.00
AMDEK RGB COLOR II	859.00
AMDEK RGB INTERFACE	169.00
COMREX 12" GREEN MONITOR	165.00

MOUNTAIN HARDWARE

CPS MULTIFUNCTION BOARD	199.00
ROMPLUS W/ KEYBOARD FILTER	179.00
ROMPLUS W/O KEYBOARD FILTER	130.00
KEYBOARD FILTER ROM	49.00
COPYROM	49.00
MUSIC SYSTEM	369.00
ROMWRITER	139.00
APPLE CLOCK	252.00
A/D + D/A	299.00
EXPANSION CHASSIS	580.00
RAMPLUS 32K	149.00

S-100 HARDWARE

Alpha Byte is your new S-100 headquarters! We've expanded our line of S-100-compatible hardware. Here's just a few of the lines we carry:

CALIFORNIA COMPUTER SYSTEMS

2200A MAINFRAME	459.00
2065C 64K DYNAMIC RAM	539.00
2422 DISK CONT. & CP/M®	359.00
2710 4 SERIAL I/O	279.00
2718 2 SERIAL / 2 PARALLEL I/O	269.00
2720 4 PARLLEL I/O	199.00
2810 Z-80 CPU	259.00

QT COMPUTER PRODUCTS

18 SLOT M/F W/P.S.	430.00
12 SLOT M/F W/CUTOUTS FOR 2-5¼"	500.00
12 SLOT M/F W/CUTOUTS FOR 2-8"	600.00
8 SLOT M/F W/CUTOUTS FOR 2-8"	550.00

STATIC MEMORY SYSTEMS

"LAST MEMORY" BOARD 64K	500.00
"LASTING MEMORY" PROM PROG	299.00

ADVANCED MICRODIGITAL SINGLE S-100 BOARD COMPUTER

SUPERQUAD 1 ASYNCHRONOUS	724.00
SUPERQUAD 2 SYNCHRONOUS	745.00

COMREX

"THE TIMEPIECE" S-100 CLOCK	125.00

SIERRA COMPUTER PRODUCTS

S-100 PROM PROGRAMMER A/T	240.00
S-100 PROM PROGRAMMER KIT	195.00
S-100 PROTOTYPE MODULE SEMI KIT	90.00

Other S-100 manufacturers include Mountain Hardware, Cromemco, SSM, Compupro, with more being added. Watch for our December ad for Christmas specials. If you don't see it here, call us — we'll get it at our every-day low prices.

MODEMS

NOVATION CAT ACOUSTICS MODEM	135.00
NOVATION D-CAT DIRECT CONNECT	156.00
NOVATION AUTO-CAT AUTO ANS	219.00
NOVATION APPLE-CAT (300 Baud)	310.00
NOVATION APPLE-CAT (1200 Baud)	605.00
UDS 103 LP DIRECT CONNECT	175.00
UDS 103 JLP AUTO ANS	209.00
HAYES 100 MODEM (S-100)	325.00
HAYES SMART MODEM (300 BAUD)	227.00
HAYES SMART MODEM (1200 BAUD)	540.00
HAYES CHRONOGRAPH	199.00
LEXICON LEX-11 MODEM	109.00
SIGNALMAN MODEM W /RS-232C	85.00

TERMINALS

TELEVIDEO 910	639.00
TELEVIDEO 912C	745.00
TELEVIDEO 920C	830.00
TELEVIDEO 950C	995.00
ADDS-VIEWPOINT	599.00
HAZELTINE ESPRIT	510.00
VISUAL-50 GREEN	690.00

TRS-80 MOD I HARDWARE

PERCOM DATA SEPARATOR	27.00
PERCOM DOUBLER II W /DOS 3.4	159.00
TANDON 80 TRK DISC DRIVE W/P.S.	345.00
TANDON 40 TRK DISK DRIVE W/P.S.	289.00
LNW DOUBLER W/DOSPLUS 3.3	138.00
LNW 5/8 DOUBLER W/DOSPLUS 3.4	171.00
MOD III DRIVE KIT W /DRIVES	875.00

IBM DISK DRIVES

Alpha Byte's add-on drive kits for the IBM-PC — each kit includes installation instructions.

1 Tandon TM100-1 Single head 40 trk.	195.00
1 Tandon TM100-2 Double head 40 trk	269.00

IBM HARDWARE

SEATTLE 64K RAM +	370.00
QUADBOARD 64K	464.00
64K MEMORY UPGRADE	80.00

ALPHA BYTE IBM MEMORY EXPANSION BOARDS

256K W /RS-232C	349.00
256K W /RS-232C & SUPERCALC	529.00
512K W /RS-232C	599.00
512K W /RS-232C & SUPERCALC	749.00

HARD DISK DRIVE SPECIAL

5¼'' Winchester, cabinet, P.S. controller, assembled and tested. Attaches to your Z-80 CPU system in minutes. Runs on Northstar, Heath/Zenith, TRS-80 Mod II, Apple w/ CP/M® , CCS and others. Hardware must be Z-80 /CPM® system. The included self-installing software attaches to your CP/M® system. 6-month warranty. No effect on your present floppy disk system. Includes all cables and installation instructions.

10 MEGABYTES	2370.00
20 MEGABYTES	3180.00

ISOLATORS

ISO-1 3-SOCKET	53.95
ISO-2 6-SOCKET	53.95

BARE DRIVES

TANDON 5¼ INCH

100-1 SINGLE HEAD 40 TRK	195.00
100-2 DUAL HEAD 40 TRK	269.00
100-3 SINGLE HEAD 80 TRK	250.00
100-4 DUAL HEAD 80 TRK	369.00

TANDON THINLINE 8 INCH

848-1 SINGLE SIDE	379.00
848-2 DUAL SIDE	490.00

MICRO PRO

APPLE CP/M®

WORDSTAR*†	199.00
SUPERSORT*†	109.00
MAILMERGE*†	60.00
DATASTAR*†	162.00
SPELLSTAR*†	109.00
CALCSTAR*†	109.00

MICROSOFT

APPLE

FORTRAN*	150.00
BASIC COMPILER*	315.00
COBOL*	550.00
Z-80 SOFTCARD	299.00
RAMCARD	139.00
TYPING TUTOR	17.95
OLYMPIC DECATHLON	24.95
TASC APPLESOFT COMPILER	145.00

IBM SOFTWARE

PEACHTREE SERIES 4	269.00
VOLKSWRITER	145.00
WRITE ON	90.00
EASYWRITER II	247.00
HOME ACCOUNTANT +	105.00
VISICALC / 256K	189.00
WORDSTAR	285.00
MAILMERGE	79.00

Call for additional IBM software prices.

APPLE SOFTWARE

MAGIC WINDOW	79.00
MAGIC SPELL	59.00
BASIC MAILER	59.00
DB MASTER	169.00
DB MASTER UTILITY PACK	69.00
DATA CAPTURE 4.0/80	59.95
PFS: GRAPH	89.95
PFS: (NEW) PERSONAL FILING SYSTEM	85.00
PFS: REPORT	79.00
Z-TERM*	89.95
Z-TERM PRO*	129.95
ASCII EXPRESS	63.95
EASY WRITER-PRO	199.00
EASY MAILER-PRO	79.00
EXPEDITER II APPLESOFT COMPILER	73.95
A-STAT COMP. STATISTICS PKG	129.00
SUPER TEXT II	129.00
LISA 2.5	59.95
TRANSCEND II	115.00
PEACHTREE SERIES 4 / 40	269.00
SCREENWRITER II	99.00
DICTIONARY	79.00

CONTINENTAL SOFTWARE

G/L	199.00
A/R	199.00
A/P	199.00
PAYROLL	199.00
PROPERTY MGMT	399.00
THE HOME ACCOUNTANT	59.95
FIRST CLASS MAIL	55.00

VISICORP

DESKTOP PLAN II	189.00
VISIPLOT	158.00
VISITREND/VISIPLOT	229.00
VISIDEX	189.00
VISITERM	79.00
VISICALC	189.00
VISIFILES	189.00

mu MATH/mu SIMP	200.00
mu LISP/mu STAR	165.00

TRS-80 GAMES

INVADERS FROM SPACE	17.95
PINBALL	17.95
MISSILE ATTACK	18.95
STAR FIGHTER	24.95
SCARFMAN	17.95

TRS-80 SOFTWARE

NEWDOS/80 2.0 MOD I,III	139.00
LAZY WRITER MOD I,II	165.00
PROSOFT NEWSCRIPT MOD I,III w/labels	99.00
SPECIAL DELIVERY MOD I,III	119.00
X-TRA SPECIAL DELIVERY MOD I,III	199.00
TRACKCESS MOD I	24.95
OMNITERM SMART TERM.MOD I,III	89.95
MICROSOFT BASIC COMP. FOR MOD I	165.00
LDOS 5.1 MOD I,III	119.00

Save 33%

FRANKLIN ACE 1000	**1595.00**
RANA DISK DRIVE	**449.00**
RANA DRIVE CONT. CARD	**135.00**
C.ITOH 8510 PRINTER	**795.00**
MICROBUFFER 32K	**299.00**
NEC 12" GREEN MONITOR	**200.00**
VERBATIM DISKS	**45.00**
LIBRARY CASE	**5.00**

~~$3523~~

Now $2352

CP/M® SOFTWARE

We carry CP/M® software in all popular disk formats. Call for availability and price.

THE WORD-SPELL CHECK	69.00
d BASE II	429.00
SUPER CALC	189.00
SPELLGUARD	230.00
P & T CP/M® MOD II TRS-80	175.00
COMMX TERMINAL PROG	82.50
C BASIC 2	96.00
PASCAL Z	349.00
PASCAL MT +	439.00
PASCAL/M	205.00
SYSTEM PLUS- G/L,A/R,A/P,P/R,	1799.00
CONDOR I	579.00
CONDOR II	849.00

DIGITAL RESEARCH

MAC	89.00
SID	69.00
ZSID	97.00
PL/ 1-80	439.00

SUPERSOFT

DIAGNOSTIC I	69.00
DIAGNOSTIC II	89.00
'C'COMPILER	179.00
UTILITIES I	59.00
UTILITIES II	59.00
RATFOR	89.00
FORTRAN	239.00

MICROPRO

WORDSTAR	285.00
SUPERSORT	160.00
MAILMERGE	95.00
DATASTAR	220.00
SPELLSTAR	150.00
CALCSTAR	195.00

MICROSOFT

BASIC 80	249.00
BASIC COMPILER	299.00
FORTRAN 80	359.00
COBOL 80	419.00
MACRO 80	185.00

APPLE GAMES

PERSONAL SOFTWARE

CHECKER KING	21.95
GAMMON GAMBLER	21.95
MONTY PLAYS MONOPOLY	29.95

BRODERBUND

GALAXY WAR	20.95
ALIEN TYPHOON	20.95
APPLE PANIC	23.61
MIDNIGHT MAGIC	27.26
SPACE QUARKS	24.95

AUTOMATED SIMULATIONS

INVASION ORION	20.95
STAR WARRIOR	31.35
TUES. MORNING QUARTERBACK	25.95
CRUSH,CRUMBLE AND CHOMP	24.95
THE DRAGON'S EYE	20.95
TEMPLE OF APSHAI	31.35
HELLFIRE WARRIOR	31.35
RESCUE AT RIGEL	23.36

MUSE SOFTWARE

ROBOT WARS	32.95
THREE MILE ISLAND	31.61
A.B.M	19.46
GLOBAL WAR	20.95
CASTLE WOLFENSTEIN	23.36

ON-LINE SYSTEMS

WIZARD AND PRINCES	27.26
MISSILE DEFENSE	27.26
SABOTAGE	20.95
SOFT PORN ADVENTURE	23.36
THRESHOLD	31.16
JAW BREAKER	23.36
CROSSFIRE	24.95
TIME ZONE	77.96
H/R FOOTBALL	32.95
H/R CRIBBAGE	20.95
PEGASUS II	23.36

SIRIUS SOFTWARE

SPACE EGGS	23.36
GORGON	31.16
SNEAKERS	23.36
EPOCK	27.26
BEER RUN	23.36
HADRON	29.95
PULSAR II	23.36

EDU-WARE

PERCEPTION PKG	19.95
COMPU-READ	24.95
COMPU-MATH: ARITHMETIC	39.95
COMPU-MATH: FRACTIONS	34.95
COMPU-MATH: DECIMALS	34.95
COMPU-SPELL (REQ. DATA DISK)	24.95
COMPU-SPELL DATA DISKS 4-8, ea	17.95

MORE GREAT APPLE GAMES

COMPUTER QUARTERBACK	31.16
TORPEDO FIRE	49.95
THE SHATTERED ALLIANCE	49.95
POOL 1.5	27.26
ULTIMA	31.16
RASTER BLASTER	23.36
FLIGHT SIMULATOR	26.61
INTERNATIONAL GRAND PRIX	25.95
SARGON II	28.95
SHUFFLE BOARD	29.95
FIREBIRD	24.95
SNACK ATTACK	23.36
THIEF	24.95
ROACH HOTEL	27.26
JABBERTALKY	24.95
THE WARP FACTOR	31.16
COSMO MISSION	23.36
WIZARDRY	37.95
ZORK I	28.00
ZORK II	28.00
DEADLINE	39.00

Call our Modem line for weekly specials.

Alpha Byte COMPUTER PRODUCTS

To order or for information call (213) 706-0333

Modem order line: (213) 883-8976

We guarantee everything we sell for 30 days — no returns after 30 days. Defective software will be replaced free, but all other software returns are subject to 15% restocking fee and must be accompanied by RMA slip. No returns on game software, unless defective.

We accept VISA and MasterCard on all orders; COD orders, up to $300.

Shipping charges: $3 for all prepaid orders, actual shipping charges for non- prepaids; $3 for COD orders under 25lbs. ($6 for over) plus a $4 surcharge; add 15% for foreign, FPO and APO orders. Calif. add 6% sales tax, L.A. County add 6½%.

Prices quoted are for stock on hand and are subject to change without notice.

31245 LA BAYA DRIVE, WESTLAKE VILLAGE, CALIFORNIA 91362

CIRCLE 108 ON READER SERVICE CARD

CP/M is a reg. trademark of Digital Research. *Requires Z-80 Softcard. †Reg. trademark of Micro Pro International Corp. ‡Trademark of Practical Peripherals, Inc.

QUME

SALE! $2255.

Unparalled quality at an unprecedented price.

Now SPRINT 9/45 daisywheel printers are on sale at a new low price of $2255.00. Move quickly and you'll get Qume's legendary high resolution 45 cps printing, plus our unique quality guarantee. If anything goes wrong with your new SPRINT 9/45, we'll repair your printer within 24 hours or our name isn't Qume.
So don't miss the daisywheel sale of the year. Contact your nearest authorized Qume distributor.

Qume®
A Subsidiary of ITT

2350 Qume Drive
San Jose, CA 95131.

CALIFORNIA
Anthem Systems Corp.
(415) 342-9182

Byte Industries, Inc.
(800) 972-5948 (CA only)
(800) 227-2070 (outside CA)

David Jamison Carlyle Corp.
(213) 277-4562

Data Systems Marketing
(714) 560-9222

Data Technology Industries
(415) 638-1206

Terminal Rentals
(714) 832-2414

WASHINGTON
Anacomp/ESCOM Division
(206) 881-1113

TEXAS
Audio Visual Services
Division of Photo and Sound
(713) 659-1111
(800) 392-7777

Unico
(512) 451-0251

MINNESOTA
Bohlig and Associates
(612) 922-7011

MASSACHUSETTS
Butler Associates
(617) 965-1080

Microamerica Distributing
(617) 449-5807

Victor Electronics
(617) 481-4010

PENNSYLVANIA
C & G Distributors, Inc.
(412) 366-5056 or
(800) 245-1084

NEW YORK
The Computer Factory
(212) 687-5000

General Electric
Instrumentation and
Communication Equipment
Service Programs
(518) 385-4888

Schweber Electronics Corp.
(516) 334-7474

Western New York Computer
(716) 381-4120

NEVADA
Computing Resources, Inc.
(702) 825-8800

NEW JERSEY
Computer Mart of New Jersey
(201) 283-0600

GEORGIA
Equipment Resources
(404) 995-0313

FLORIDA
Gentry Association
(305) 859-7450

NORTH CAROLINA
InterACT Computer Systems
(704) 254-1949

Office Systems, Inc.
(704) 374-0822

ILLINOIS
National Computer Syndicate
(312) 459-6400

Tek Aids Industries Inc.
(312) 870-7400

COLORADO
Par Associates
(303) 371-4140

MARYLAND
Pioneer Washington Electronics
(301) 948-0710

VIRGINIA
Terminals Unlimited
(703) 237-8666 or
(800) 336-0423

CANADA
Abacus Data Services
(416) 677-9555

Data Terminal Mart
(416) 677-0184

Datamex Ltd.
(416) 781-9135

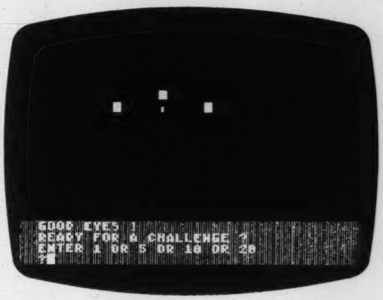
CIRCLE 369 ON READER SERVICE CARD

the past. After all I had been out of the business for several years. How could it hurt to sit down for a few minutes to see what the little fellow could do?

In less time than you can say Beginners All Purpose Symbolic Instruction Code, I had the Atari off the shelf and ready to go. Although I had never programmed in Basic before, there was enough of a logical similarity to other high level languages that with a little prompting from the Basic manual I was off and running.

Over the next few evenings, I reintroduced myself to the world of IFs, THENs, GOTOs, strings, subscripts and various other programming concepts. The feeling was definitely odd. It was like meeting old friends I had not seen in years. They had not changed one bit—for better or for worse. Some, like the nested IFs, still caused me no small amount of trouble whenever I took them for granted. Others, as in the case of the GOTO, were still as straightforward as ever.

Then suddenly, about two nights before Christmas as I worked my way through Sound and Graphics, it hit me. Without even realizing it, I was having fun. It was like the old days when I had worked with "Baby Bear" at my first job. But there was a significant difference. The room I sat in was my own. The light by which I worked was soft. The colors and fabrics in the room were part of a human environment. I did not have to fight anyone to get computer time. I was a person enjoying a personal experience.



```
GOOD EYES !
READY FOR A CHALLENGE ?
ENTER 1 OR 5 OR 10 OR 20
?
```

Now it was time to put together what I had learned the past few evenings. What better way was there than to write a program. The question was, what to write? The answer came quickly. With Christmas not two days away, what better project could there be than to create a present for the children—a small electronic game they could play.

After a bit of thought, I set down some basic specifications. The program would have to be relatively straightforward and short. I didn't have that much time. Plus I was still quite rusty. However, I wanted something that would pose an appropriate challenge to my skills. Finally it also had to be something the children would find entertaining as well as challenging.

I finally decided on an electronic version of the old Shell Game. Working into the early hours of the morning, I was able to finish the initial logic for the game, leaving the testing for the following night.

And so the proverbial Night Before Christmas found St. Nick at his Atari testing a last minute present for the big day. Time flew, and soon the morning light seeped into the living room to announce the arrival of the children as they made their way to the tree and the presents which lay beneath. They were somewhat surprised to find me up at that hour.

"What are you doing?" they asked.

"You'll see," I managed to reply.

Paper ripped and the camera clicked. In less than an hour the booty lay displayed. My daughter modeled her clothes while my son booped and beeped his way to electronic heaven with his new hand-held game.

Several hours later, my daughter remembered seeing me when she had first awakened. Leading the kids to the living room, I told them to turn on the computer. This they did and sat down to play. I watched as their faces lit up while trying to follow the shells being moved around on the screen. I followed the squeals of delight when they guessed which shell the pea was under and groaned along with them when their guesses were wrong. Finally my daughter turned to me.

"Daddy, you did this?" she asked.

I nodded.

"Really?" my son added.

All I could do was beam.

Seeing the "bottom line" in my children's faces, I forgot about the hours of frustration the night before while debugging the program. The thrill and satisfaction I had felt years ago when I first worked with "Baby Bear" had returned. Unfortunately, so did the neighbors.

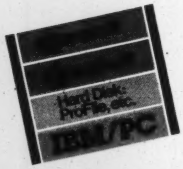
I was actually sad to see the Atari go. Still, I had been given a second chance to look into the future and found once more that it was good. ☐

Listing 1.

```
5 DIM A$(1)
7 DIM B$(1)
10 MOVE=100:MVA=1:MV2=2:MV3=3:MV4=4
20 MV5=5:PH=0:P1=1:P2=1:P3=4
30 X10=10:X15=15:X20=20:POS1=1
40 NEG1=-1:NXTMOV=600:RNDMOV=800
45 SETUP=900
50 FRTY=40:FIFTY=50
60 Y=10:Z=Y:SV2=2
80 X40=40:X60=60:X80=80
85 ZERO=0:MV10=10
90 GRAPHICS 3
92 COLOR 2
94 SETCOLOR 4,9,2
96 GOTO 300
100 FOR M=MVA TO MVB
110 COLOR 2
120 PLOT X,Y
130 PLOT W,Z
140 FOR S=SVA TO SVB:NEXT S
150 COLOR 4
160 PLOT X,Y
170 PLOT W,Z
180 X=X+XV:Y=Y+YV
190 W=W+WV:Z=Z+ZV
200 NEXT M
205 COLOR 2
210 PLOT X,Y
220 PLOT W,Z
230 RETURN
300 REM * * * MAINLINE * * *
400 GRAPHICS 7
405 COLOR 1
410 SETCOLOR 4,9,2
415 PLOT 61,39:DRAWTO 62,39
420 PLOT 61,38:DRAWTO 62,38
425 Y=32
427 RNDH=ZERO
430 FOR M=MVA TO MV4
435 COLOR 2
440 PLOT X40,Y:DRAWTO X40+3,Y
445 PLOT X60,Y:DRAWTO X60+3,Y
450 PLOT X80,Y:DRAWTO X80+3,Y
455 Y=Y+1
460 NEXT M
465 PRINT "READY?"
470 INPUT A$
475 IF A$<>"Y" THEN 465
480 P1=4:P2=1:P3=4
485 FOR M=MVA TO MV4
490 COLOR 2
500 PLOT X40,Y:DRAWTO X40+3,Y
505 PLOT X60,Y:DRAWTO X60+3,Y
510 PLOT X80,Y:DRAWTO X80+3,Y
515 FOR S=SVA TO FIFTY:NEXT S
520 COLOR 4
525 PLOT X40,Y-4:DRAWTO X40+3,Y-4
530 PLOT X60,Y-4:DRAWTO X60+3,Y-4
```

The Only Database That's Smart Enough For Business Forms.

- Invoicing
- Purchase Orders
- Client Billing
- Medical Claims
- Sales Analysis
- Personnel Records
- Inventory Ledgers
- Mfg. Parts Lists



VersaForm™

Business Form Processor

Applied
Software
Technology

14125 Capri Drive
Los Gatos, California 95030
(408) 370-2662

CIRCLE 113 ON READER SERVICE CARD

NEW **Kits Now Available**

NEWPORT "Pro-Sticks"
the Mercedes of Joysticks
'Creative Computing Magazine' Aug. 1982

Soft-Touch Controllers
for busy fingers and fast action

NEW Extension "Y" Adapters
with rapid fire action

Build your own custom video-game controls from our proven high quality arcade components.

Create your own control console right in your home. Send $3.00 for a brochure of creative and innovative ideas in custom video game joysticks and controllers. Includes easy to follow schematics and instructions for Atari, Apple, Pet Commodor, TSR-80, and other computers, and a complete kit and components price list.

INQUIRE ABOUT OUR CLUB DISCOUNTS

Please rush me ____ brochures at $3.00 each (includes First Class Mail and handling) and mail to:

Name ____________________

Address ____________________

City ____________ State ______ Zip ________

NEWPORT MACHINE DESIGN
P. O. Box 418, Bishop, CA 93514
(714) 873-5677

CIRCLE 251 ON READER SERVICE CARD

FAMILY ROOTS

REMOVES THE DRUDGERY FROM YOUR GENEALOGY.

- 6 types of charts and sheets
- indices
- user fields
- notes, footnotes, and sources
- no limits
- adapts to your hardware
- comprehensive
- easy to use

— AND MUCH, MUCH MORE.

Send for brochure and sample printouts. FAMILY ROOTS includes detailed manual and 2 full diskettes of programs for your Apple II.* Other genealogy software also available.

*TM Apple Computer, Inc.

VISA and MASTERCARD accepted

QUINSEPT, INC.
P.O. BOX 216
LEXINGTON, MA 02173
(617) 862-0404

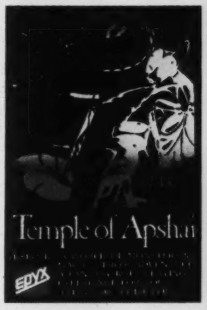
CIRCLE 289 ON READER SERVICE CARD

Burn-Out, continued...

```
535 PLOT X80,Y-4:DRAWTO X80+3,Y-4
540 Y=Y+POS1
545 NEXT M
560 GRAPHICS 3
570 COLOR 2
575 SETCOLOR 4,9,2
580 Y=X10:Z=Y
585 PLOT X10,Y
590 PLOT X15,Y
592 PLOT X20,Y
595 NXTCNT=X15
600 NXTCNT=NXTCNT-POS1
605 SVB=SVB-CH
610 IF NXTCNT=ZERO THEN 650
620 RNDMOV=((INT(3*RND(1)))*10)+800
622 IF RNDH=RNDMOV THEN 620
624 RNDH=RNDMOV
630 GOTO RNDMOV
650 GRAPHICS 7
652 COLOR 2
654 SETCOLOR 4,9,2
656 Y=X20+X20:XA=Y:XB=Y+X20:XC=Y+Y
660 WA=XA+3:WB=XB+3:WC=XC+3
670 FOR M=MVA TO MV4
672 COLOR 2
674 PLOT XA,Y:DRAWTO WA,Y
676 PLOT XB,Y:DRAWTO WB,Y
678 PLOT XC,Y:DRAWTO WC,Y
679 Y=Y-POS1
680 NEXT M
685 PRINT "PICK A SHELL - A,B,C"
687 INPUT A$
690 Y=36:Z=Y
692 IF A$="A" THEN 700
694 IF A$="B" THEN 710
696 IF A$="C" THEN 720
698 GOTO 685
700 C=P1:X=X40:W=X+3
705 GOTO 725
710 C=P2:X=X60:W=X+3
715 GOTO 725
720 C=P3:X=X80:W=X+3
725 FOR M=MVA TO MV2
730 COLOR 2
732 PLOT X,Y:DRAWTO W,Z
734 FOR S=SVA TO FRTY:NEXT S
736 COLOR 4
738 PLOT X,Y+4:DRAWTO W,Z+4
740 COLOR C
744 PLOT X+1,Y+4:DRAWTO X+2,Z+4
746 Y=Y-POS1:Z=Y
748 NEXT M
750 FOR M=MVA TO MV2
752 COLOR 2
754 PLOT X,Y:DRAWTO W,Z
756 FOR S=SVA TO FRTY:NEXT S
757 COLOR 4
758 PLOT X,Y+4:DRAWTO W,Z+4
760 Y=Y-POS1:Z=Y
762 NEXT M
775 IF C=POS1 THEN 790
780 PRINT "PICK ANOTHER"
785 GOTO 687
790 PRINT "GOOD EYES !"
792 PRINT "READY FOR A CHALLENGE ?"
793 PRINT "ENTER 1 OR 5 OR 10 OR 20"
794 INPUT CH:CH=MV2*CH
795 GOTO 300
800 X=X10:W=X20:MV=MV10
803 PH=P1:P1=P3:P3=PH
805 GOTO SETUP
810 X=X10:W=X15:MV=MV5
813 PH=P1:P1=P2:P2=PH
815 GOTO SETUP
820 X=X15:W=X20:MV=MV5
823 PH=P2:P2=P3:P3=PH
825 GOTO SETUP
900 XV=ZERO:YV=POS1
905 WV=ZERO:ZV=NEG1
910 MVB=MV3
915 GOSUB MOVE
920 XV=POS1:YV=ZERO
925 WV=NEG1:ZV=ZERO
930 MVB=MV
935 GOSUB MOVE
940 XV=ZERO:YV=NEG1
945 WV=ZERO:ZV=POS1
950 MVB=MV3
955 GOSUB MOVE
960 GOTO NXTMOV
```

Slaying Monsters Should Be Mostly Fun and Games

An EPYX game from Automated Simulations



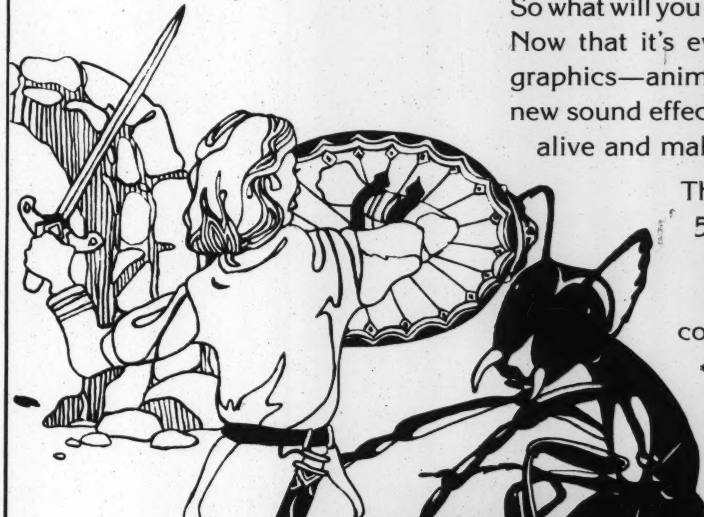
Be one of more than 16 million alter-egos that your computer can generate. Walk into a labyrinth filled with traps, treasures and monsters. There you'll test your strength, constitution, dexterity, intelligence . . . against thousands of monsters in over 200 caverns and chambers—growing in wealth, power and experience as you progress through the four levels of the dungeon.

Your character will do whatever you want him to do. Do battle—in real time—with the likes of giant ants, ghouls, zombies...Explore the various levels of the maze and discover the great treasures within.

The Game Manufacturer's Association named The Temple of Apshai the computer game of the year. The Temple is the very first computer game—ever to win the Hobby Industry award for excellence. There can be only one reason for that: it's a great game.

So what will you think of The Temple of Apshai now? Now that it's even better than ever. With better graphics—animated movement—and completely new sound effects that make your computer come alive and make The Temple even more fun.*

The Temple has a superbly illustrated 56-page Book of Lore, and your local dealer has it for the ATARI,** TRS-80,** APPLE,** and IBM** computers.



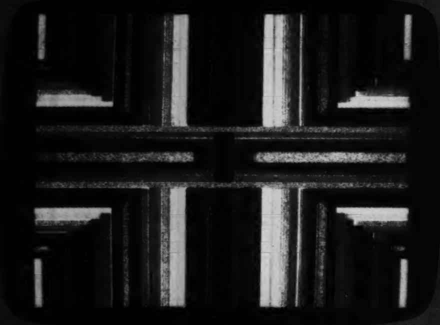
*If you already have The Temple of Apshai, you can enjoy these great improvements. Just send us your original cassette or disk together with your check for $5.00 and we'll send you the brand new version—with better-than-ever graphics and sound.

**ATARI, TRS-80, APPLE and IBM are trademarks of Atari, Inc., Tandy Corp., Apple Computer, Inc., and IBM, respectively.

©1981, **AUTOMATED SIMULATIONS, INC.,** P.O. Box 4247, Mountain View, Ca., 94040.

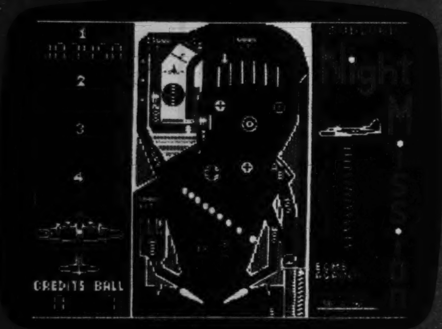
EPYX COMPUTER GAMES THINKERS PLAY

CIRCLE 120 ON READER SERVICE CARD



Musician or not, experience the ultimate in audiovisual pleasure.

Music Maker



The maximum in entertainment.
Infinite in variety.

Pinball

SPEED
TURN
ENERGY

Adventure on a grand scale.

Space Vikings

subLOGIC
Communications Corp.
713 Edgebrook Drive
Champaign, IL 61820
(217) 359-8482
Telex: 206995

Superlative software.
Don't settle for less.

48K Apple II disk.

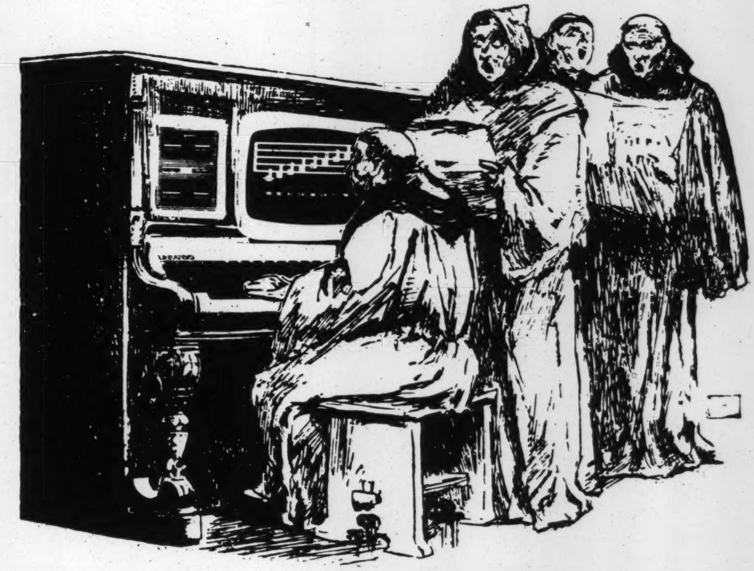
See your dealer...
or write for brochures.

"Apple" is the registered trademark of Apple Computer Inc.

CIRCLE 343 ON READER SERVICE CARD

Computer Carols

John Anderson



Rupert the Red-Rimmed Hacker

Rupert the red-rimmed hacker
Had a shining subroutine
Just couldn't get it working
Without locking his machine.

Olive, Rupert's main backer
Laughed and said "Forget it, hon"
She didn't think poor Rupert
Could ever make the damned thing run.

Then one soggy Christmas Eve
Awake at 4 AM
Rupert shook with raw insight
"I just need to shift a byte!"

Rupert the red-rimmed hacker
To his waiting micro dashed
Booted the disk and fainted
As his only copy crashed.

Diskettes

Diskettes whirring in a warm disk drive
No bad sectors in your DOS
New software is soon due to arrive
And no heads waiting to degauss

Plus no data loss

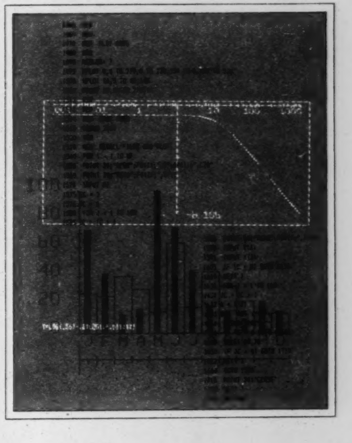
Some gaming and some programming
Helps to keep the screen alight
Tiny tots with their minds all a-sting
Will find it hard to type tonight.

They know that Daddy is in their way
That until he's done he'll keep the kids
at bay
And every mother's child is gonna cry
When Daddy says "Another minute, guy"

It's no wonder why

I'm offering some quick advice
To dads from one to ninety-two
Although you're absorbed, you'd do well
to realize
It ain't there just for you.

DATA PLOTTING
SOFTWARE
FOR
MICROS



21 Programs
Fully Documented, Copyable
BASIC Listings
Apple II and IBMpc

PIE CHARTS • BAR CHARTS
STOCK MARKET CHARTS
3D SURFACES • HISTOGRAMS
LOG PLOTS • CURVE FITTING
REGRESSION ANALYSIS
DATA MANAGEMENT
STATISTICAL ANALYSIS
TEXT ON GRAPHICS

All programs listed in Applesoft BASIC in a 248 pg book with theory, equations, full explanation of how they work. Modular and menu driven. Use as is, modify and combine for your own applications, or use as building blocks to develop your own programs. Optional 5¼" disks of listings availble for Apple II+ DOS3.3 48K and IBMpc DOS1.1 48K. This is your best buy in data plotting software!
Book: $28.50 Disk: $19.95

ALSO AVAILABLE

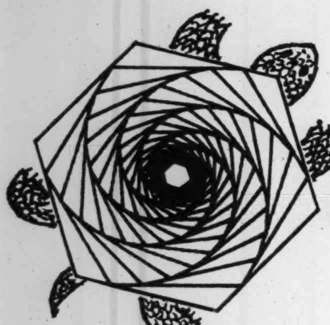
Graphic Software for Micros: a self-teaching guide to writing 2D and 3D graphics software-61 programs-*"..the best book available on micro graphics.."*-Creative Computing 2/82.
Book: $21.95 Disk: $19.95

Engineering Software for Micros: 25 programs for CAD, Fourier analysis, optimization, etc.
Book: $28.50 Disk: $19.95

Structural Analaysis Software for Micros: 14 programs-2D,3D trusses, frames & more.
Book: $39.95 **Disk: $24.95**

KERN PUBLICATIONS
Send check, money order, **VISA/MASTERCARD** no with exp date to 190 Duck Hill Rd, PO Box 1029, Duxbury, MA 02332. Add $2 per book postage in US, $3 UPS, $4 Canada, $12 air Europe and Central America, $18 elsewhere. Specify Apple or IBM with disk orders.
For faster delivery call (617)934-0445

CIRCLE 215 ON READER SERVICE CARD



Logo Ideas

Robert Lawler

Computers And People

Is playing with computers good for children? Couldn't it be bad? Might they not begin to think of themselves and others as machines? Here is a story about how my daughter, Miriam, pretended to be a machine — the Logo turtle — and what she made of that.

This night is the last night of summer, so defined by the children's having to begin school on the morrow. Over the summer they have gradually become accustomed to going to bed late, and now, in order to rise early, they should go to bed early. No one found this argument convincing. We negotiated a compromise that the children get into pyjamas, return for dessert (delayed by conversation with dinner guests, Jose and Fernando), and then go off to bed. Robby lived up to the agreement; Miriam would not.

When given a direct order to go to bed, she went to my bed instead of hers. I had mentioned during dinner the children's inclination to play turtle. Fernando tried to help. "Miriam, FORWARD." She did nothing. I advised him that he had omitted the carriage return. Upon his "carriage return" Miriam complained, "You haven't told me how far to go," chuckled, and popped back onto my bed. Gretchen attempted "FORWARD 100, carriage return." With the gripe "You haven't told me how to FD100" still in the air, I described this bug as the well known space omission between command and input.

Fernando was then precise: "Miriam: FORWARD, space, 100, carriage return." Miriam played fair and proceeded stepwise (counting each step) down the length of the loft. At first, we expected 100 steps to be too few. Miriam counted 70 in the kitchen and at 88 gleefully announced "Out of bounds" as she walked into the wall in the hallway. While so close to her bed room, she picked up her "security blanket" (the air was a little chilly) and came skipping back into the living area.

The game wore on (hide turtle under the blanket, and so forth), and after a while became wearing. I finally directed her to bed with the threat of physical force. Miriam replied, as she has for some months now, with the counter-threat "I'm quitting your research, Daddy, I really am." Having thus preserved her dignity, she acquiesced to the demand that she go to bed.

In this incident and many others, Miriam showed that this robot role which she was willing to adopt was one she subjected utterly to her ends as a person. Playing turtle was an enrichment of her repertoire, not a constraint upon it. As we paraphrase William Blake:

> *Tools were made; born were hands.*
> *Every child understands.*

Robert Lawler, Centre Mondial, Informatique Et Resources Humaines, 22 Avenue Matignon, 7508 Paris, France.

Single-Key Interfaces

Young children, especially those who have never used a typewriter — and even more so those who have not yet learned to read — can have a great deal of fun with turtle geometry if using the keyboard is made simple for them. One obvious and simple way to do so would be to make an "interface" for their use. An interface translates what someone keys into Logo commands and then executes those commands. Many have been made in the past, and surely more will come. Typically, the simplifications are in reduction of the child's keying burden to a single character for any action desired. For example, when the child keys the single character F, the interface translates this into the command FORWARD 20 and executes it.

Many computer-based games depend upon the speed of reaction of the person playing the game. Consider a real-time game in which you must fire a rocket to change the trajectory of a space ship. Keying FIRE and "return" could take so long that the result of the force would be different from what you wanted. In contrast, keying a single letter whose value was encoded to mean FIRE could be effective at once in changing the speed of the space ship.

Have you ever wondered why the letters on the typewriter keyboard or the computer terminal are where they are? Alvin Toffler relates the history of keyboard development, pointing out that the keyboard arrangement was made difficult on purpose, to slow people down so that their high speed keying would not jam the originally slow-moving mechanical linkages of early machines. Would you like to make your own keyboard arrangement? You can. All you need is an interface which will substitute your characters for those wired at the keyboard, and a set of sticky labels to show how the interface will assign meaning to the keys struck.

Summary

Writing an interface which reads one character at a time is a primary way of shaping your computer environment to be what *you* want it to be like. You can make it simpler, or more responsive; you can even change the meanings of individual keys. ☐

TWO MILLION PEOPLE COULD USE YOUR SOFTWARE.

TOO BAD THEY'VE NEVER HEARD OF YOU.

At last count, more than a couple of million Americans owned personal computers. And that number is expected to triple by 1985.

That's a fertile environment for software sales. But a lot of personal computer software organizations are discovering it's not as easy as they might have thought.

The problems boil down to these:

Lack of awareness on the part of personal computer buyers. Lack of understanding on the part of personal computer salespeople. Lack of unlimited dollars to advertise in the myriad magazines that reach this small segment or that small segment of the total market.

If any of this sounds like a familiar frustration to you, we've got good news. *LIST* is here. And its advent heralds a new era in cost-effective software marketing.

LIST isn't another guide. It's not another directory. It's an informative new publication that puts software first. And puts you in touch—directly, inexpensively—with the fastest growing segments of the personal computer market.

With *LIST,* you'll be able to reach business and professional people at a critical point in the purchase cycle—*before* they've bought their hardware.

At the same time, you'll be able to impact another significant market segment—those people who already own personal computers, and are eager to learn how they can do more with them.

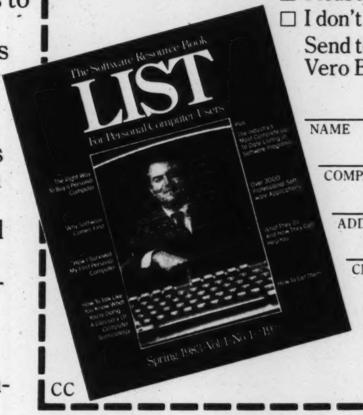
To find out how *LIST* can expand the awareness of your software for less than $200, send us this coupon. (Hurry! We go to press December 15.)

Or don't. And go on being less well known than you deserve to be.

LIST is published by Redgate Publishing Co., an affiliate of E F Hutton & Co.

1 800 327-1300
In Florida call: 1 305 231-6904

"I WANT TO MAKE MORE PEOPLE AWARE OF MY SOFTWARE."



☐ Please send me literature that explains how *LIST* can help.
☐ I don't want to wait on the mails. Call me right away.

Send to *LIST,* Redgate Publishing Co., 3407 Ocean Drive,
Vero Beach, FL 32960. **Or phone 1 800 327-1300.**
In Florida call: 1 305 231-6904

NAME ______ TITLE ______

COMPANY ______ TELEPHONE ______

ADDRESS ______

CITY ______ STATE ______ ZIP ______

LIST™
The Software Resource Book
For Personal Computer Users

CC

© 1982 Redgate Publishing Company

CIRCLE 296 ON READER SERVICE CARD

The Countess And The Computer Language

Part II

Geoff Gilpin

Ah, you've returned. The Countess of Lovelace is pleased that you are interested in learning more about her namesake, the computer language Ada. Before plunging into new material, however, here is a recap of what happened last month.

After a brief history of Ada (both the Countess and the computer language), we saw a genuine Ada program, like this one:

```
with TEXT_IO; use TEXT_IO;
procedure EXAMPLE is -- specification

begin -- body
put ("Lady Lovelace welcomes you back!");
end EXAMPLE;
```

As illustrated by EXAMPLE, Ada syntax is very much like that of Pascal or any number of high level "structured" languages. The most prominent difference so far is the division of EXAMPLE into a *specification*, which gives the information needed to connect the program with its environment, and the *body*, which details the actions taken when the program is run. The specification of EXAMPLE tells the Ada compiler that a *package* called TEXT_ IO is part of the environment of EXAMPLE. The *put* procedure used to print the Countess's greeting is contained in TEXT_ IO and would be unavailable without the *with* and *use* clauses.

Aside from general syntax, last month's article looked at how data is defined and manipulated in Ada. We saw that all the usual data types and structures are available as well as several exotic ones. We saw user defined types:

```
type SECONDS is integer range 1..60;
```

derived types:

```
type MY_INTEGER is new integer;
```

enumeration types:

```
type COLOR is (RED, BLUE, YELLOW);
type BEATLE is (John, Paul,
                George, Ringo);
```

and many other strange and wonderful things.

Although Ada is the first language to incorporate all of the features discussed last month, nothing that we saw could be considered truly unique. Now, however, it is time to look at the most important, and most revolutionary, feature of Ada—program organization.

In Ada, the concept of a "program" is very nebulous. An Ada program is rarely a single entity; instead it is a confederation of smaller units woven into a loose hierarchy. Although things get blurry here, the Department of Defense suggests that Ada program units should be grouped together into a *library*, a vague term that says little about the overall structure of the language. Things will undoubtedly get clearer as the language evolves.

Ada programs can be constructed from a variety of building blocks. These *program units* can be combined in several ways to accommodate different styles of programming. Since the permutations can become very confusing (Ada is a *big* language), I will restrain myself and pull just two program units (subprograms and packages) out of Ada's grab-bag, using each to illustrate a particular style of programming.

An Ada subprogram can be a *procedure* or a *function*. Here is an ordinary looking example:

```
function SUM (X, Y, Z: integer)
        return integer is

begin
return X+Y+Z;
end SUM;
```

Geoff Gilpin, 1018 N. Leminwah St., Appleton, WI 54911.

RH ELECTRONICS, INC.

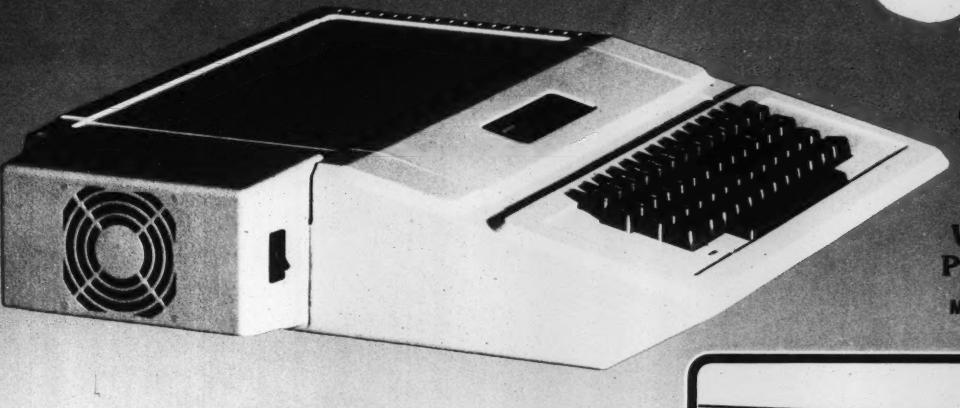
COPYRIGHT © [illegible] — PATENTS PENDING

566 Irelan, Buellton, CA 93427
(805) 688-2047
8:00 TO 5:00 CALIFORNIA TIME

COMPUTER PRODUCTS
DESIGNING • MANUFACTURING
ELECTRONIC ENGINEERING

SUPER FAN II™

FOR YOUR APPLE II* COMPUTER

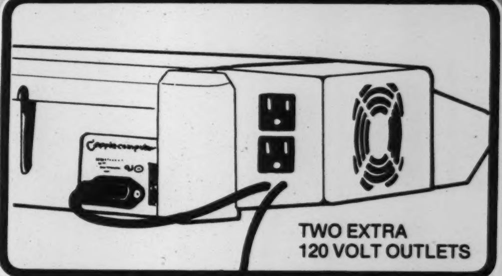


One Year Warranty

$74.95

With Zener Ray™ Protection $109.00

MASTERCARD — VISA



"COOL IT"

- ALSO FITS ON APPLE'S* NEW MONITOR STAND
- RED PILOT LIGHT ON/OFF SYSTEM SWITCH
- CLIPS ON — NO HOLES OR SCREWS • REPLACEABLE SWITCH
- AVAILABLE IN 120V or 240V AND 50/60 HZ • DURABLE MOTOR
- REDUCES HEAT CAUSED BY EXTRA PLUG-IN CARDS
- SOLD WORLD WIDE • UNIQUE 1 YEAR WARRANTY
- TAN OR BLACK COLOR • QUIETEST FAN ON THE MARKET
- INCREASED RELIABILITY — SAVES DOWN TIME AND REPAIR CHARGES
- LOW NOISE DUE TO DRAWING EFFECT OF AIR THROUGH YOUR COMPUTER AND SPECIAL FAN AND MOTOR DESIGN
- TWO EXTRA 120V OUTLETS FOR MONITOR AND ACCESSORIES TURN ON WHEN YOU TURN ON YOUR FAN (NOT AVAILABLE ON 240V MODEL)

SUPER FAN II™ WITH ZENER RAY OPTION $109.00

ZENER RAY™ TRANSIENT VOLTAGE SUPPRESSOR

OUR BUILT IN ADVANCED DESIGN UNIT GIVES
DRAMATIC COST SAVINGS — STOPS ANNOYING DOWN TIME
INSURANCE FROM VOLTAGE SPIKES - GLITCHES

DANGEROUS VOLTAGE SPIKES CAN JEOPARDIZE YOUR COMPUTER SYSTEMS
PROTECT COMPUTER - DISK DRIVE - PRINTER AND MONITOR

NO CUTTING WIRES • WON'T VOID WARRANTY, JUST PLUG IN SUPERFAN II WITH ZENER RAY

OTHER PRODUCTS BY RH ELECTRONICS, INC.

SUPER RAM II™ 16K RAM CARD FOR YOUR APPLE II. 2 YEAR WARRANTY $125

GUARDIAN ANGEL™ AN UNINTERRUPTABLE POWER SOURCE $595

12 VOLT TRANSVERTER 12 VOLT — RUNS YOUR APPLE II COMPUTER AND AND 5¼" DRIVE FROM YOUR CIGARETTE LIGHTER $149

*Registered trademarks of Apple Computer Inc.

DEALER INQUIRIES INVITED

CIRCLE [illegible] ON READER SERVICE CARD

MAX-COMMAND

The time is the early 21st Century and a strategic Air-Land battle has begun on the plains of AlphaGorda. As General of the MAX•COMMAND™ strike group, your forces include Dart Intruder Squadrons, Armored Infantry, Shikari Tanks, Mobile Laser Artillery, Perseus Missiles and one "ultimate weapon" the Max One. All combat and movements are instantly observed on your command monitor. Although both Sovereign powers have developed advanced tracking and fire control systems, weather and varying terrain may frustrate even the best of tacticians. History is in the making.

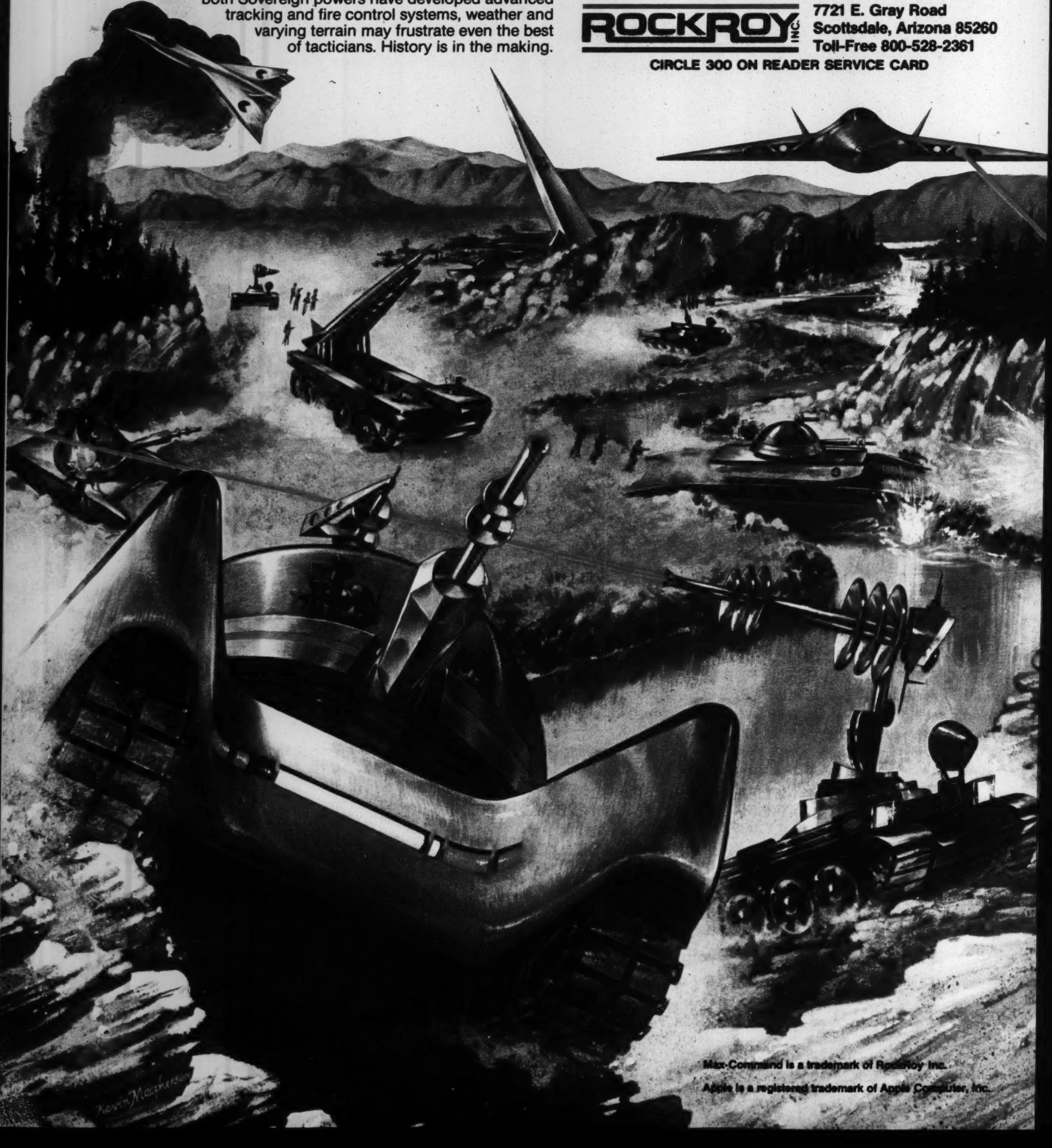
• Hi-Res Graphics • Optional Sound • 2 Player or Computer Opponent • Instant Combat Resolution • Thousands of Battlefields • Rapid Play Strategy Game

For your Apple® (48K, Disk with Applesoft in ROM). Visit your local dealer today. VISA and M/C holders may order by calling Toll-Free. $39.95 includes shipping & handling.

ROCKROY INC.

7721 E. Gray Road
Scottsdale, Arizona 85260
Toll-Free 800-528-2361

CIRCLE 300 ON READER SERVICE CARD



Max-Command is a trademark of Rockroy Inc.

Apple is a registered trademark of Apple Computer, Inc.

Parameters

This example demonstrates the basic syntax of an Ada function. The *formal parameters* X, Y, and Z are listed along with their mandatory data type. The type of data returned by the function appears in the specification after the keyword *return*. Formal parameters can be of different data types, in which case they must be separated by a semicolon, as in

```
procedure HARMONY (HIGH,
                   MIDDLE,
                   LOW:     BEATLE;
                   SINGERS: INTEGER) is
```

Once declared, subprograms are invoked in the normal way, e.g.

```
        A := SUM (B, C, D);
```

or

```
   HARMONY (John, Paul, George, 3);
```

As usual, function calls may be part of a larger expression while procedure calls must appear on a line by themselves.

Aside from a data type, formal parameters may also have a *mode* that determines how they are matched up with the actual parameters in the calling routine. Modes come in three flavors: *in out*, and *in out*. Here is a procedure that illustrates modes:

```
procedure SQUARESUM (X: in integer;
                     Y: in out integer;
                     Z: out integer) is

begin
X := X**2;    -- "**" is
Y := Y**2;    -- exponentiation operator
Z := X+Y;
end SQUARESUM;     -- no "return"
```

Our new example procedure might be invoked like this:

```
X_TERM := 3; Y_TERM := 4;
SQUARESUM (X_TERM, Y_TERM, ANSWER);
put (X_TERM);   -- Pardon all the
put ("   ");    -- "put" statements.
put (Y_TERM);   -- Ada needs one
put ("   ");    -- for each
put (ANSWER);   -- data type.
```

and the resulting output would be:

```
          3   16   25
```

X TERM was unchanged because its corresponding formal parameter was declared with the *in* mode, which is used for accepting a value without modifying it in the calling routine. Following this example, you will probably see that *in out* formal parameters *do* modify the variable in the calling routine, in this case leaving Y TERM equal to the square of four. The last mode, *out*, is only used for passing values back to the calling routine.

In other words, *in* parameters can enter a subprogram but not leave it, *out* parameters can leave but can't get in, and *in out* parameters can do both. If no mode is specified, *in* is assumed.

Now things start to get interesting.

When a subprogram is called, the formal parameters may be explicitly named. The function call

```
   A := SUM (Y => 5, X => 6, Z => 10);
```

would assign a value of 21 to A. Notice that when the formal parameters are named, they may appear in any order, just like the array aggregates we met last month.

Subprograms may have *default* parameters, which are declared by an assignment within the parameter list.

```
function SUM (X: integer := 1;
              Y: integer := 2;
              Z: integer := 3)
                 return integer is
```

SUM may now be called with anywhere from zero to three parameters, the ones left unspecified will take the default values. All the following are legal calls.

```
A := SUM;             -- A=6
A := SUM (4);         -- A=9
A := SUM (4, 5);      -- A=12
A := SUM (4, 5, 6);   -- A=15
A := SUM (Z => 10);   -- A=23
```

Overloading

One of the most powerful features of Ada subprograms is called *overloading*. This means that multiple procedures or functions can be declared with the same name. For instance, a single Ada program might contain these two functions:

```
function SUM (X, Y, Z: integer)
           return integer is

function SUM (X, Y, Z: float)
           return float is
```

A Pascal compiler attempting to make sense of this program would halt at the second function and complain "identifier declared twice." In Ada, everything is fine. Once compiled, an appropriate test for the overloaded function SUM might be

```
put (SUM (4, 5, 6)); put ("   ");
put (SUM (4.0, 5.0, 6.0));
```

which will produce

```
            15    15.0
```

Does this seem strange? It shouldn't—the concept of overloading has been around for a long time, and you have probably made considerable use of it without knowing it. Most common languages have a set of built-in routines, such as math functions, which are overloaded.

In Fortran the function SQRT can be used to take the square roots of both integers and real numbers. The same routine is not used in both cases, of course, since the internal operations used on one kind of number would not work on the other. When you put SQRT(4) and SQRT(4.0) in the same program, Fortran looks at the parameter and calls the appropriate routine. There is no need to write a SQRE routine for reals and a SQIN for integers since the data type of the argument makes it clear which you want.

Up till now, however, overloading had been present only in built-in functions; Ada makes it available to the programmer.

This review of subprograms will end with a look at an especially bizarre kind of overloading (which is also one of my favorite things in Ada).

Consider the statement HUE := RED. How is this different from the statement NUMBER := 2? Assigning a number to a variable involves a different set of operations than the assignment of an enumeration value, yet both are represented by the operator :=. That's right, operators are overloaded too and, yes, the programmer may do the overloading.

All standard Ada operators—+, /, mod, **, etc.—are available for redefinition. A computer dating service might use operator overloading to do complex processing of data structures called MALE and FEMALE. The process would look just like the previous example of overloading except that the function name (since operators are used in expressions their overloading must always be done in function subprograms) is the operator symbol.

```
function "+" (MAN:   MALE;
              WOMAN: FEMALE)
              return COUPLE is

begin
WEDDED_COUPLE.HUSBAND := MAN.NAME;
WEDDED_COUPLE.WIFE    := WOMAN.NAME;
return WEDDED_COUPLE;
end "+";
```

A wedding may now be accomplished by the statement

```
NEWLYWEDS := BRIDE + GROOM;
```

where the variables WEDDED COUPLE and NEWLYWEDS are of type COUPLE and BRIDE and GROOM are variables of the FEMALE and MALE types. The expression BRIDE + GROOM produces a value of type COUPLE which can be legally assigned to NEWLYWEDS. In this case, the + operator certainly doesn't stand for numeric addition; perhaps it could be referred to as the "mating" operator.

Without overloading, the only operators normally available for use with user-defined data types are assignment (:=) and equality (=) although the other relational operators are defined for enumeration values. If you want to add complex numbers (as in Fortran or PL/1) you must first define them and then overload the appropriate operators. If you want matrix arithmetic (as in Basic) the process is repeated. This might seem odd for a language with so many built-in features, but the added power and flexibility are certainly worth it. This is one area of Ada in which the programmer's imagination is given free rein.

As I said, different program units illustrate different styles of programming. Ada supports two styles—*top down* programming, implemented with procedures and functions, and *bottom-up* programming which is done with packages.

ROLLER SKATES
SIZE 0.2
Brian Hansen

"Ten to one we get cancer from these things, Squeaky."

Top-Down Programming

The top-down method is the classic structured programming strategy in which a big program is divided up into small, easily implemented pieces. In Ada, procedures and functions may be nested within themselves (and within other program units) to an arbitrary depth. They may also be removed from their context (or *host unit*) and compiled on their own, ultimately winding up in that mysterious library.

When this is done the programmer must supply the information needed to link up the pieces. For instance, suppose our EXAMPLE procedure relied on another procedure called ADA_GREETINGS to print the Countess's felicitations. ADA_GREETINGS might simply be elaborated inside EXAMPLE or, if it is to be separately compiled, its specification is declared inside EXAMPLE like this:

```
procedure EXAMPLE is
    procedure ADA_GREETINGS is separate;
    -- other declarations

begin
-- body of EXAMPLE
end EXAMPLE;
```

The keyboard *separate* is called a *body stub* because it takes the place of the procedure body. Now when ADA_GREETINGS is written its parentage must be included in the specification:

```
separate (EXAMPLE)
    procedure ADA_GREETINGS is
```

In this way, ADA_GREETINGS becomes a *subunit* of EXAMPLE. The genealogical relations between Ada program units, like those in an Irish clan, can become quite convoluted.

Although the top-down method is the reigning champion of programming styles, Ada anticipates a day when the opposite method will be just as common. In the bottom-up scheme, large programs are put together from a set of general purpose building blocks called packages.

An analogy can be found in the construction trade where a slab of prefabricated concrete can be used to build either a ranch house or an auditorium. The TEXT_IO package is an example of this kind of building block. It provides a collection of Ada resources which can be used by different programs in different ways.

Packages

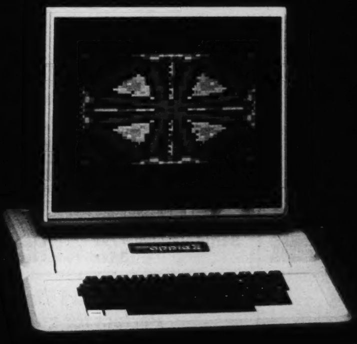
To illustrate the use of packages, suppose that you are part of a programming team that is developing the software for a new video game. Although each programmer is involved with a different aspect of the game, everyone will need access to certain basic procedures and data files. At the beginning of the project these resources would be grouped together in a package, compiled, and placed in a library for use by one and all. Doing this looks a great deal like writing a procedure.

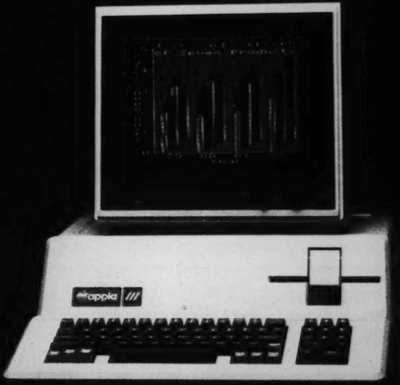
Obviously, the distinction between specification and body is greater with packages than with other Ada program units. In fact, the specification and the body can be (and frequently are) compiled separately. This is in keeping with Ada's philosophy of "everything in its proper place."

Everything that is to be public (i.e., all the resources used by the program units that access the package) goes into the specification, including the specifications of any subprograms contained within the package, such as COLLISION.

GOOD NEWS

Have you put aside buying a color monitor because it's too expensive?
But, have you looked at the new TAXAN RGBvision color monitor?
Would you be excited at a suggested retail price of $399.oo for the RGBvision I, and $599 for the RGBvision II?





DO WE HAVE GOOD NEWS FOR YOU!

For those low prices, you can have:

☑ Full compatibility with Apple III and IBM PC without interface modules
☑ Compatible with Apple II through the TAXAN "RGB-II" card
☑ RGBvision I medium resolution · 380(H) lines
☑ RGBvision II high resolution · 510(H) lines
☑ Unlimited colors through linear amplifier video circuit and 16 colors for Apple III and IBM PC
☑ 12-inch, 90° deflection CRT display

TAXAN 12" green phosphor monitor model KG12N, features an 800 line resolution at center, 2000 character display

Can you really afford to turn all that down without looking at the TAXAN RGBvision monitors? See your local dealer for a demonstration.

TAXAN

TSK ELECTRONICS CORPORATION

1524 Highland Avenue
Duarte, California 91010
A subsidiary of Kaga Denshi

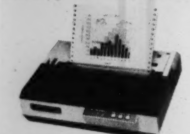
Apple II and III are trademarks of Apple Computer, Inc.
IBM PC is a trademark of International Business Machines, Inc.

CIRCLE 304 ON READER SERVICE CARD

OUR PRICES, SELECTION AND SAME-DAY SHIPPING MAKE US COMPETITIVE.

Red Baron. Home of the Nation's

NEC 8023
Outstanding Graphics, Print Quality & Performance



144 x 160 dots/inch • Proportional Spacing • Lower case descenders • N x 9 dot matrix • 8 character sizes • 5 unique alphabets • Greek character set • Graphic symbols • 100 CPS print speed • Bi-directional logic-seeking • Adjustable tractors • Single-sheet friction feed • Vertical & horizontal tabbing

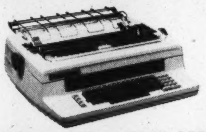
NEC 8023
Dot Matrix..........List $795 **$Call**

IDS Prism 80/132
Affordable Color, Speed

Dot Resolution Graphics • 9-wire staggered printhead • Lowercase decenders • Over 150 CPS • Bi-directional, logic-seeking • 8 character sizes • 80-132 columns • Proportional spacing • Optional Color • Text justification

Prism 80 .... Base List $999
Prism 132 ...... Base List $1,299 **$Call**

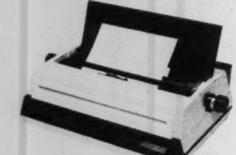
NEC Spinwriter 7700 & 3500
Daisy Wheel Quality Leader



High speed, letter quality • 55/33 CPS • Typewriter quality • Bi-directional printing & proportional spacing • Quiet • OCR quality print • Hi-res plotting/graphing • Quick change ribbon • Optional cut-sheet feeder, horizontal or bidirectional tractors • Prints up to 8 copies.

NEC Spinwriter RO
Serial Parallel 77xx ....List $3055 $2500
35xx ....List $2290 $1900

Smith Corona TP-1
Daisy Wheel Printer For Under $900



Letter quality • Standard serial or parallel data interface • Drop-in ribbon • 144 WPM • Various fonts available • Loads paper like typewriter • Handles single sheets for forms

Smith Corona TP-1 ..... List $895 **$Call**

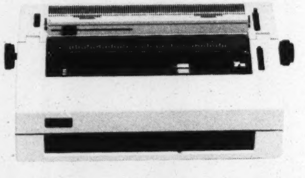
The Epson Series
High-Quality Printers at a Low Price.

FREE GRAFTRAX PLUS

Epson MX80 ....List $645
Epson MX80FT ......List $745 **$Call**
Epson MX-100 ....List $995

Full Line of Epson Accessories

Brothers HR-1 Daisy Wheel
Perfect for quality, quiet word processing.



• 16 CPS • Prints up to 6 copies • Bidirectional • Cloth or carbon quick-change cassette ribbon • Quiet, efficient operation for word processing •

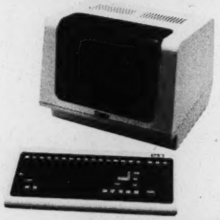
Brothers HR-1 (Parallel) List $1,100
Brothers HR-1 (Serial). . List $1,200 **$Call**

Anadex Silent Scribe
The Quiet Serial Matrix Impact Printer

Up to 200 CPS • Dot addressable graphics • Parallel and serial interfaces standard • Switch selectable protocol • Cartridge ribbon • Foreign character sets • Underlining • 1.5K to 3.5K buffer • Correspondence quality print

Anadex DP-9500A..... List $1,725
Anadex DP-9620A..... List $1,845 **$Call**
Anadex DP-6000...... List $3,250

Televideo CRT's
Price, Performance & Reliability



910.......List $699
925.......List $995
950.......List $1195

$Call For low Prices

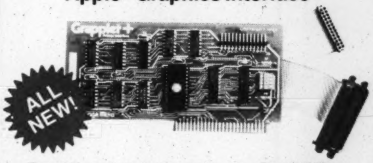
Interface Equipment
Complete Stock of Options, Cables and Accessories.

CCS APPLE SERIAL Interface & Cable	$150
ORANGE INTERFACE for Apple II Parallel Interface Board & Cable	$90
NOVATION CAT Acoustic Coupler	$175
NOVATION D-CAT direct connect modem	$180
COMPLETE STOCK OF EPSON ACCESSORIES	$Call
CUSTOM PRINTER CABLES FOR Apple, Atari, IBM, TRS-80 (all models)	$Call
HAYES MICROMODEM II	$300
PRINTER STANDS: Large	$99
Small	$25
PRINTER RIBBONS—Most Types	$Call

OUR PEOPLE MAKE US EXPERTS.

Largest Computer Printer Inventory.

The Grappler+™
Apple® Graphics Interface

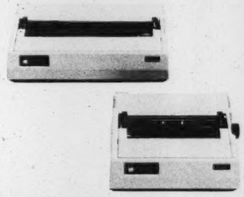


• Graphic and text screen dumps • Dual Hi-Res Graphics • Printer Selector Dip Switch • Apple III compatible* • Inverse Graphics • Emphasized Graphics • Double Size Picture • 90° Rotation • Center Graphics • Works with Pascal and CPM® • No software needed

Grappler+ $175

*Requires software driver
Apple is a registered Trademark of Apple, Inc.

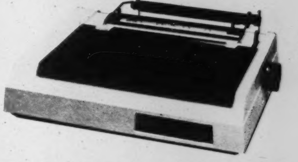
The Okidata Series
Hi-Res or TRS 80 Block Graphics



120 CPS • 9×9 Matrix • Bidirectional logic seeking printing • Lower case descenders • four print styles • Optional Hi-Res Graphics

Okadata 82A.........List $649
Okadata 83A (w/Tractor)..List $995 **$Call**

IDS Microprism 480
Prints like a daisy, priced like a matrix!



• Correspondence Quality in a Single Pass • Dual Speed 75, 110cps • Proportional Spacing • Bidirectional Logic Seeking Head • Platen pin or pressure feed • 24x9 dot matrix • 10, 12, 16.8 Characters per inch • Double width Characters

IDS Microprism 480...List $799 **$Call**

Our People, Our Product: Both Are Specialized.

Because our salespeople are printer specialists, they know the capabilities of each printer—and how to match one to your exact need. Red Baron's volume stocking assures a low, low price on a wide array of major brands. We're sure you'll like the product and services you get from Red Baron, and we know you'll love our Customer Benefit Package; an exclusive at Red Baron.

Customer Benefit Package

1. **Free Expert Consultation.** Before you buy, after you buy. 2. **Technical Staff.** Even your most involved questions get quick, helpful answers from our staff of printer technicians. 3. **Free Catalog.** Get your informative catalog with printer comparison chart and print samples today! 4. **Warranty.** The manufacturer's warranty applies where applicable. 5. **Same-Day Shipping.** Your order is shipped the same day when you call before 11:00 a.m. 6. **Free MasterCard and Visa.** Call us toll-free and charge your printer to your credit card. 7. **We Stock What We Sell.** No bait and switch, no hassle. We make every effort to keep a large stock of our advertised products. 8. **APO/FPO Orders Welcome.**

Other Quality Printers at Red Baron

C. Itoh 8510 Prowriter	$845	$Call
Diablo 630/6	$2995	$2570

Here's How To Order:

Phone orders are welcome; same-day shipment on orders placed before 11:00 a.m. Free use of MasterCard and Visa. COD's accepted. Personal checks require 2 weeks clearance. Manufacturer's warranty included on all equipment. Prices subject to revision.

Call Toll Free For Catalog:

(800) 854-8275
CA, AK, HI (714) 630-3322

MasterCard VISA

Red Baron
COMPUTER PRODUCTS

1100 N. TUSTIN #207, ANAHEIM, CA 92807
CIRCLE 294 ON READER SERVICE CARD

© Red Baron Computer Products, 1982

TRANSYLVANIA

A High Resolution Graphic Adventure

Crafted by
Antonio Antiochia

penguin software
the graphics people

830 4th Avenue, Geneva, Illinois 60134
(312) 232-1984

Program designed by Antonio Antiochia,
Mark Pelczarski, and Dave Albert
Graphics created with The Graphics Magician

CIRCLE 267 ON READER SERVICE CARD

```
package VIDEO_GAME_ENVIRONMENT is
   -- specification

   SCREEN_WIDTH:  constant integer := 256;
   SCREEN_HEIGHT: constant integer := 190;
   type POS is    record
                  X: integer
                     range 1..SCREEN_WIDTH;
                  Y: integer
                     range 1..SCREEN_HEIGHT;
                  end record;
   GAME_OVER:     Boolean;
   GAME_PRICE:    integer range 25..100;

   procedure GET_ENEMY_COORD (EPOS: POS);
   procedure GET_PLAYER_COORD (PPOS: POS);
   function COLLISION (PLAYER, ENEMY: POS)
            return Boolean;

   end VIDEO_GAME_ENVIRONMENT;
   -- end specification


package body VIDEO_GAME_ENVIRONMENT is
   -- body

   function COLLISION (PLAYER, ENEMY: POS)
            return Boolean is

   begin
   if PLAYER.X=ENEMY.X and PLAYER.Y=ENEMY.Y
      then return true; -- collision
      else return false;
      end if;
   end COLLISION;

   -- similar elaborations of
   -- GET_ENEMY_COORD
   -- and GET_PLAYER_COORD

   begin   -- initialization
   GAME_OVER := false;
   GAME_PRICE := 25; -- cents
   end VIDEO_GAME_ENVIRONMENT;
   -- end of body
```

The contents of the body area available only to the package. Since the inner workings are sealed off from the outside world, the whole package can be changed without affecting any of the program units that access it. This compartmentalization also prevents any tampering—both unintentional and otherwise—that might cause unpredictable results.

Packages may exist on their own or they may be declared within other program units. They may contain data, subprograms, and other packages, all of which may be concealed to varying degrees through the use of the *private* declaration (which won't be discussed here). The initialization section is optional and in our example it could have easily, and more elegantly, been replaced by assignments in the declaration section.

Now that these handy resources have been gathered together in a single package and safely stashed away in a library, how do you—the applications programmer—make use of them?

Using Packages

Suppose that you have written a program that calls the COLLISION routine contained in VIDEO_GAME_ENVIRONMENT. Your program must include the information that the Ada linker needs to locate the package and make its resources available. This is done with the two Ada keywords—*with* and *use*—that were employed to access the

Computer Program Books for Beginners

Everything you need to start programming your own computer.

ATARI 400/800 Computers

101 ATARI Computer Programming Tips & Tricks, learn-by-doing instruction, hints, secrets, shortcuts, techniques, includes 101 ready-to-run programs, 128 pages **$8.95**

31 New ATARI Computer Programs For Home, School & Office, practical type-n-run software, 96 pages **$8.95**

ATARI Computer BASIC Coding Form, 40-sheet tablet with stiff back, makes writing programs, fun, easy **$2.95**

TIMEX 1000/Sinclair ZX-81

101 TIMEX 1000/Sinclair ZX-81 Programming Tips & Tricks, secrets, hints, shortcuts, techniques, learn-by-doing instruction, 101 ready-to-run programs, 128 pages **$7.95**

37 TIMEX 1000/Sinclair ZX-81 Computer Programs For Home, School & Office, useful type-n-run software, 96 pages **$8.95**

TIMEX/Sinclair ZX-81 BASIC Coding Form, 40-sheet tablet with stiff back, makes writing programs easy **$2.95**

APPLE Computer

101 APPLE Computer Programming Tips & Tricks, secrets, hints, shortcuts, techniques, includes 101 ready-to-run programs, 128 pages **$8.95**

33 New APPLE Computer Programs For Home, School & Office, practical type-n-run software, 96 pages **$8.95**

APPLE Computer BASIC Coding Form, 40-sheet tablet with stiff back, makes writing software fun, easy **$2.95**

TRS-80 Color Computer

101 Color Computer Programming Tips & Tricks, learn-by-doing instructions, hints, secrets, techniques, includes 101 programs, 128 pages **$7.95**

55 Color Computer Programs For Home, School & Office, practical ready-to-run software, colorful graphics, 128 pages **$9.95**

55 MORE Color Computer Programs For Home, School & Office, handy companion, packed with different useful type-n-run software, colorful graphics, 112 pages **$9.95**

Color Computer Graphics, complete guide, how to make the most of Color Computer video graphics, many complete programs, 128 pages **$9.95**

The Color Computer Songbook, 40 favorite pop, classical, folk, seasonal, type-n-run music programs to play on color computer, 96 pages **$7.95**

Color Computer BASIC Coding Form, 40-sheet tablet with stiff back, makes writing software easy, fun **$2.95**

TRS-80/Sharp/Casio Pocket Computers

99 Tips & Tricks For The New Pocket Computers, for PC-2/PC-1500, all new useful graphics & business/home/education software, 99 ready-to-run programs, 128 p **$7.95**

Pocket Computer Programming Made Easy, fast new easy read-n-learn way to quickly understand BASIC, how to make PC-1/-2/PC-1211/-1500/FX-702P work for you, 128 p **$8.95**

101 Pocket Computer Programming Tips & Tricks, secrets, hints, shortcuts, techniques, includes 101 type-n-run programs, for PC-1/PC-2/PC-1211/PC-1500, 128 pages **$7.95**

35 Practical Programs For The CASIO Pocket Computer, useful type-n-run software for FX-702P, 96 pages **$8.95**

Pocket Computer BASIC Coding Form, 40-sheet tablet with stiff back, makes writing programs a breeze **$2.95**

Order direct from this ad. Send check, money order, or Mastercard or VISA account number and expiration date. Include $1 shipping for each item ordered up to a maximum of $3. Or write for our free catalog. Mail to:

ARCsoft Publishers

MasterCard

POST OFFICE BOX 132 M
WOODSBORO, MARYLAND 21798
(301) 663-4444

VISA

Customers wanting airmail send US $4 postage per item ordered. Sorry, no COD.

CIRCLE 115 ON READER SERVICE CARD

APPLE® ATARI® IBM® TRS-80® CP/M® NEC® COMMODORE® ZENITH®

Get Fast Delivery and Discount Pricing on All Hardware and Software!

Super Low Printer Prices

- Free Delivery on $50 Orders! *
- Over 1,000 Programs From Over 80 Manufacturers
- Large Inventory - Most Orders Ship Within 24 Hours
- 15 - 35% Discount On All Products

FOR EXAMPLE:

MIN. SAVINGS	
DB MASTER ®	$54.00
VISICALC ®	$60.00
TIME ZONE	$25.00
dBASE II	$220.00

FREE CATALOG

LOW COST 100% APPLE-COMPATIBLE DISK DRIVES

RANA SYSTEMS DRIVES: 20Kbytes *more* storage (double side/density delivers over 650Kbytes), 300% faster tracking, 50% better precision than Apple. Unique finger tip write/protect switch and more.

Add a drive to present Apple controller or use Rana's controller with 4 drive capacity.

MOST HARDWARE 10% ABOVE COST

SYSTEMS	PRINTERS	MONITORS	PERIPHERALS
Apple	Anadex	Adds	Rana Systems
Atari	Epson	Amdek	Orange Micro
Altos	C.Itoh	Televideo	Hayes
VIC-64	Okidata	NEC	Microtek
Zenith	IDS	Zenith	Axion
North Star	NEC	Sanyo	Mountain Computer
Televideo	Transtar	And More!	Vista
NEC	Trendcom		Universal Data
And More!	And More!		And Much More!

BLANK DISKETTES

Elephant Memory Systems (E.M.S.)
Heavy Duty, Guaranteed 100% Error Free, with Hub Rings

	E.M.S.	Verbatim	Maxell
5¼" Single Sided Single Density, Soft Sector . . .	$24.95	$28.95	$34.95
5¼" Single Sided, Double Density Soft Sector 10 Sector or 16 Sector	$27.95	$28.95	$34.95

Double Sided', 8", Dysan, 3M and others

ALL Software and Accessories From These and Other Manufacturers Are Available With Full, No Hassle 90 Day Guarantee

Adventure International · Broderbund Software · Budgeco · Datasoft Edu-Ware · Gebelli · Hayden · Howard · Innovative Design · Micro Lab Micro Pro · Microsoft · Muse · On-Line Systems · Piccadilly · Sensible Visicorp [Personal Software] · Sirius · Stoneware · Synergistic · TG Products

FREE FAST DELIVERY! on orders over $50

Most Orders Shipped Within 24 Hours!

*We take MasterCard and VISA (include card number and expiration date). Maryland residents add 5% sales tax. Include $2.00 for postage on orders less than $50.00. Add $1.50 for C.O.D. orders. Foreign and hardware shipments are extra. Prices subject to change. Some prices reflect 3% cash discount.

VISA® MasterCard

® Apple is a Registered Trademark of Apple Computer, Inc
® ATARI is a Registered Trademark of ATARI, Inc.
® TRS-80 is a Registered Trademark of Tandy Corporation
® CP/M is a Registered Trademark of Digital Research
® IBM is a Registered Trademark of International Business Machines
® Commodore is a Registered Trademark of Commodore Business Machines

PROgram +/Chromanetics
4084 HOWARD AVENUE • KENSINGTON, MD 20895

BALTO. - ANNAPOLIS (301) 532-2506
MD., D.C., NORTH VA. (301) 949-4488
OUTSIDE MARYLAND 1-800-368-2805

CLIP & SAVE

CIRCLE 137 ON READER SERVICE CARD

standard package TEXT_IO. The following is a program that can call COLLISION and use any of the other resources contained in the package:

```
with VIDEO_GAME_ENVIRONMENT;
use VIDEO_GAME_ENVIRONMENT;
procedure PLAY is

E, P: POS;

begin
while not GAME_OVER loop
      GET_ENEMY_COORD (E);
      GET_PLAYER_COORD (P);
      if COLLISION (E, P)
         then GAME_OVER := true;
         end if;
      end loop;
end PLAY;
```

The use of the three subprograms and the POS data type by PLAY would be illegal without the statement "with VIDEO_GAME_ENVIRONMENT." Although it seems redundant to require separate *with* and *use* clauses, this division of labor lets the programmer decide how much of the package is to be made visible. If a package has been separately compiled, a *with* clause must appear before the package can be accessed; *use,* with or without *with*, makes the package totally visible.

If there is no *use*, the identifiers in the package must be preceded by the package name and a dot, just like the components of a record structure. Omitting a *use* in the text of PLAY would make it necessary to re-write the declaration of E and P as

```
E, P: VIDEO_GAME_ENVIRONMENT.POS;
```

and to rewrite the first procedure call as

```
VIDEO_GAME_ENVIRONMENT.GET_ENEMY_COORD(E);
```

Yes, Ada can get wordy. Typically, *with* and *use* are applied separately—a single *with* clause appears at the beginning of a program unit listing all the packages needed, as in

```
with TEXT_IO, VIDEO_GAME_ENVIRONMENT;
```

Then *use* clauses are strategically placed throughout the program wherever a particular package must be totally visible.

There are exceptions, of course, such as the case of a single identifier existing in two currently visible packages. The ambiguity is overcome through the dot notation.

To the Ada novice, this visibility business seems like a big headache. But packages are the heart and soul of Ada, a language that has done more with program organization than any other. A typical Ada program is made up of dozens of little boxes which may be airtight or totally permeable depending on the needs of the programmer. This kind of control requires a great many tools, which is why Ada is such a big language.

Now for the finale: a look at one last Ada topic which will tie together the various threads of the language with special attention to packages and visibility rules.

Generics

Remember the function SUM? There were two versions, one for floats and one for integers. Since the function was so short it wasn't much trouble to write it out twice, even though the two versions were almost identical. But what if it had been 500 lines long?

Introducing the MTI® line of computers. We believe in offering you the best in complete, low cost computing.

MTI MOD III PLUS 140. A personal computer that has been designed and priced for your business, your department...yourself. MTI Computers offer you many "upgrade" features as standard. All MTI Computers include a 65-key keyboard complete with a 12-key datapad, a large 12" monitor and anti-glare screen, RS-232 printer interface, cooling unit and more. The memory is 48K and has a Z80 processor and two double density disk drives.

LOW PRICE. MTI computers are priced from $1999.

MOD III PLUS 140 Computer consists of 48K bytes of memory and a double density, dual disk drive system. The system is fully compatible with the Radio Shack® DOS and peripherals. Get 178,000 bytes of memory storage per disk.

OPTIONS:

- LETTER QUALITY PRINTER
- WINCHESTER CP/M 2.2

OTHER MODELS AVAILABLE:

MOD III PLUS 240. Same as the MOD III 140 but has double storage capacity and dual headed 40-track drives.

MOD III PLUS 280. Has 1.5 megabytes storage and 2 dual headed 80-track double density disk drives.

MOD III/WINCHESTER. Our largest computer system. 8.2 megabytes of storage. Includes a 7.5 megabyte WINCHESTER hard disk and 80-track dual head disk head.

CP/M 64K

The Mod III Plus C/140 system is an exciting new personal and small business computer that is both CP/M & TRS-DOS compatible.

■ **FEATURES:**

- 80 x 24 Display for CP/M
- 64K Bytes RAM Memory
- Microsoft BASIC language in ROM
- Internal Z80 ROM Diagnostic
- Z80 processor, 2MHz
- 64 x 16 screen-TRS-DOS-,DOS+
- Cooling system
- Parallel printer interface included
- Anti-glare screen
- 2 internal 40tk Disk Drives
- Compatible with TRS-80® Model III—RS-232 serial interface option.

Compatible with CP/M applications software such as Wordstar, Datastar and Mailmerge.

$2699

- 90 Day Warranty
- One Year Extended Warranty Available
- Local Dealer Service
- TRS-80 Compatible

MTI: YOUR BEST VALUE IN LOW COST COMPUTERS

PRICES FROM $1999

OVER 100 AUTHORIZED DEALERS
CALL 714-979-9923 for the dealer nearest you

CIRCLE 371 ON READER SERVICE CARD

/M is a registered trademark of Digital Research, Inc.
S-80® is a registered trademark of Tandy Corp.
I is a registered trademark of Microcomputer Technology, Inc.

MICROCOMPUTER TECHNOLOGY INC.
3304 W. MACARTHUR, SANTA ANA, CA 92704
(714) 979-9923 • TWX 910-595-1902 MTISNA

U.S. PRICES F.O.B. SANTA ANA
CALIFORNIA AND MAY VARY BY AREA.

IBM
compatible . . .

AMDEK
IBM
AMDEK
AMDEK
AMDEK

Go first class . . .
with your peripherals, too!

Your IBM personal computer deserves the finest, fully compatible peripherals, like Amdek's high resolution Color II Monitor . . . the new comfort-view Model "Video-310A" amber monitor . . . or the new revolutionary AMDISK-3 Micro-Floppydisk Drive with up to 1 Megabyte storage! Just call, or write for full details on these high-performance Amdek peripherals.

- ■ Color II Monitor, 13", 560(H) x 240(V) line resolution, 80 x 24 character display.
- ■ Model "Video-310A" amber phosphor screen with TTL video input. Connecting cable included.
- ■ "AMDISK-3" Micro-Floppydisk Drive, 1 Megabyte (unformatted) storage, track-to-track compatible with 5¼" drives, shirtpocket size Micro-Floppydisk Cartridge.

2201 Lively Blvd. • Elk Grove Village, IL 60007
(312) 364-1180 TLX: 25-4786

AMDEK CORP.

Amdek . . . your guide to innovative computing!

CIRCLE 111 ON READER SERVICE CARD

The philosophy of Ada is that similar objects should have to be written only once. After such an object is defined, it can be used as a template or archetype for the creation of similar objects. In Ada, the template object (which can be a subprogram, package, data type, or practically anything else) is said to be *generic*. The process of creating a new, similar, object is called *instantiation*. The following is a generic version of SUM:

```
generic         -- specification
   type T is (<>);
   function SUM (X, Y, Z: T);

function SUM (X, Y, Z: T) return T is
begin           -- body
return X+Y+Z;
end SUM
```

The specification tells us what things are to be generic, in this case the subprogram and the data type. The generic *parameter* for type T,<>symbol, is called a *box*. The box is the thing that will alter with each instantiation just like a parameter in a function call. The following examples of instantiation will create our two versions of SUM.

```
function SUM_INT is new SUM (integer);

function SUM_FLO is new SUM (float);
```

We now have two separate functions stamped from a single generic template.

Generics play an important role in Ada. The language itself has few built-in facilities for handling input/output, mathematical computation, and other necessary support functions. Instead, Ada provides a few generic packages which the user must instantiate to meet his own needs. Ada programmers do a great deal of instantiation.

For instance, the text I/O routines used in this article—*get* and *put*—are only defined for use with character data. Why characters and not, say, integers? Although Ada has only one kind of character, the familiar 8-bit ASCII creature, there are theoretically an infinite number of integers including the built-in integer types and all the derived types that a user might dream up.

SPACE GEAR INC.
DESIGN DEPT.

"... Who said anything about Baroque?"

New microcomputer software

ListMaker

from Reader's® Digest

tops the list for easy, economical information management!

ListMaker is a new, inexpensive, yet powerful software package that can help you manage information efficiently and creatively. Use **ListMaker** for — real estate listings — subscriber, patient, or customer records — membership rosters — personnel records — and a complete range of direct mail applications, from labels to personalized form letters. Automate all your files with **ListMaker** and eliminate tiresome, time-consuming, and expensive manual searching and paperwork.

ListMaker is easy-to-use, and flexible. It allows you to input information and produce hard copy in the format you need, with ready access and manipulation of records.

ListMaker features: • 12 fields of 30 characters per record • Maximum sort and search capabilities on single and multiple fields • Merging of files • Global file entries • Complete flexibility of printing applications.

ListMaker includes a program diskette and an easy-to-follow User's Manual conveniently packaged in a sturdy vinyl binder.

ListMaker Suggested Retail Price: $97.50 each.

ListMaker can be used with:
TRS-80 Model I (48K, Order #T30/104)
TRS-80 Model III (48K, Order #T34/104)
Apple II & II Plus (48K, Order #T31/104); available Nov., 1982
Atari 800 (Order #T32/104); available Dec., 1982
IBM PC (Order #T41/104); available Feb., 1983

Look for **ListMaker** at your software dealer. Or you can order direct by using coupon below.

SAVE! Include payment and save shipping costs.

**Reader's Digest Services, Inc.
Microcomputer Software Division
Pleasantville, NY 10570**

ListMaker™ is a trademark of The Reader's Digest Association, Inc. Reader's Digest software is fully warranted for 90 days. Complete details available upon request by writing to Reader's Digest at the address above.

Prices are FOB shipping point and subject to change without notice. Invoices are payable within 30 days. Merchandise may be returned in original (unmarked) condition within 30 days of delivery. Contact Reader's Digest first (914/769-7000 ext. 2763) for instructions and return label. Program availability dates subject to change.

☐ **YES!** I'd like to save time and money with **ListMaker** and my micro. Please rush me the versions I have indicated below.
☐ Payment enclosed. ☐ Bill me (subject to credit approval). CC 12/82

Qty.	Item #	ListMaker for use with:	Price ea.	Total
	#T30/104	TRS-80 Model I (48K)	$ 97.50	
	#T34/104	TRS-80 Model III (48K)	97.50	
	#T31/104	Apple II & II Plus (48K) (avail. 11/82)	97.50	
	#T32/104	Atari 800 (avail. 12/82)	97.50	
	#T41/104	IBM PC (avail. 2/83)	97.50	
			Total Order:	

☐ Please add my name to your mailing list for more information on software from Reader's Digest.

Name
Address
City/State/Zip
Signature Date

Reader's Digest Services, Inc., Microcomputer Software Division, Pleasantville, New York 10570

CIRCLE 293 ON READER SERVICE CARD

SCRG Presents

FOR YOUR APPLE™ II OR II+

THE $79.95 NUMERIC KEYPAD

THE KEYPAD

- Converts APPLE™ keyboard to one of eight 10-key or hexadecimal keypads
- Hardware conversion—compatible with **ALL** software ● Decals provided
- Works with any revision APPLE™ II or II+
- Instantly switches between standard keyboard and keypad ● Custom layouts available
- Installs easily, no soldering
- Lowest priced numeric keypad available—**$79.95**

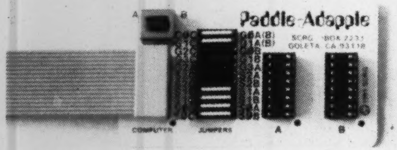
THE MAGIC KEYBOARD

Everything That **THE KEYPAD**
Gives You, Plus . . . .

- At the flip of a switch, select between standard "QWERTY" keyboard and your choice of **DVORAK, A.S.K., MONTGOMERY, LEFT & RIGHT ONE-HANDED,** and **ALPHABETICAL ORDER**
- Easy modification and optional PROM allows true upper/lower case entry.
- **$89.95**

Paddle-Adapple

I/O EXPANSION ADAPTOR



- Works with all Apple compatible joysticks and paddles
- Unique "Jumpers" socket allows you to configure to meet your needs.
- Select one of two devices or
- Use 4 paddles simultaneously
- BPI™ users can have BPI™ device and paddles plugged in simultaneously.
- Gives you four push-button inputs
- Supports shift key modification
- Exchange X & Y joystick axis
- Small and compact—adheres to computer with supplied foam tape
- All strobes, annunciators and power available on both connectors
- **LOW PRICE—$29.95**

9 CARDS AND 8 SLOTS?

The **EXTEND-A-SLOT** brings a slot outside your APPLE™, allowing an easy change of cards. The 18" flex cable is long enough to allow placement of the card in a convenient location. The high quality connectors are gold plated for reliability.

The **EXTEND-A-SLOT** works well with all slow to medium speed cards, such as Modems, Printers, Clock, Music, etc. It is not recommended for high speed data transfer devices such as disk drive controller cards. **$29.95**

All these fine products come with a 90-day warranty

Available at your local dealer or direct from:

SOUTHERN CALIFORNIA RESEARCH GROUP
Post Office Box 2231 · C
Goleta, CA 93118
(805) 685-1931

Add $2.50 for shipping:
CA and MA add tax

VISA, MASTERCARD accepted

Apple is a trademark of Apple Computers
BPI is a trademark of BPI Systems

CIRCLE 329 ON READER SERVICE CARD

Ada, continued...

Yet, the sharp-eyed reader will have noticed that *get* and *put* have been employed with various non-character objects such as integers and enumeration values. I conveniently neglected to mention that none of these examples would have worked without instantiation of an appropriate package. Now that we are familiar with generics, I will make amends.

Along with the Ada language itself, the Department of Defense has provided two support packages—INPUT_OUTPUT and TEXT_IO. The latter contains generic packages (like wheels within wheels) for handling all the predefined data types. These generic packages include INTEGER_IO, FLOAT_IO, and the *pre-instantiated* package CHARACTER_IO. The package specification for enumeration types looks like this:

```
generic type ENUM is (<>);

package ENUMERATION_IO is
   procedure GET (ITEM: out ENUM);
   procedure PUT (ITEM: ENUM;
                  WIDTH:integer := 0;
                  LOWER_CASE:
                       Boolean := false);
end ENUMERATION_IO;
```

ENUM is the generic parameter, which could be matched up with the BEATLE or any other enumeration type; WIDTH and LOWER_CASE are optional formatting controls.

Until this package is instantiated, *get* and *put* will work only with characters. After writing

```
package BEATLE_IO
   is new ENUMERATION_IO (BEATLE);

with BEATLE_IO; use BEATLE_IO;
```

get and *put* are defined (overloaded) for both types. We could write statements such as

```
CHARACTER_IO.PUT ('Z');
BEATLE_IO.PUT (RINGO);
```

but the rules of overloading make it unnecessary since the two PUTs can be distinguished by their arguments. We can get by with

```
put ('Z');     -- implied to be
               -- the PUT in CHARACTER_IO
put (RINGO);   -- the PUT in BEATLE_IO
```

Similarly, if we wanted to do I/O with integers we would have to instantiate yet another package.

```
package INT_IO
   is new INTEGER_IO (integer);

with INT_IO; use INT_IO;
```

Now *get* and *put* are overloaded for three data types. If this hadn't been done, statements such as put (1+1) would be illegal. The same thing holds for floating-point numbers and everything else except characters.

All this instantiation would be a royal nuisance if it had to be done every time you wrote an Ada program. Typically, though, Ada programmers will do it once and put the results in a single package that can be accessed by every subsequent program. This is the beauty of Ada—every programmer can have a customized tool box. Programmer Fred might assemble something like this:

```
with TEXT_IO; use TEXT_IO;
package FREDS_IO_PACKAGE is
   package FREDS_INTEGER_IO
      is new INTEGER_IO (integer);
   package FREDS_FLOAT_IO
      is new FLOAT_IO (float);
   -- and so forth.
```

Programmer Louella might find that Fred's I/O routines were useful in one part of a program while Sally's were appropriate in another. Her program might look like this:

```
with FREDS_IO_PACKAGE,
     SALLYS_IO_PACKAGE;
use  FREDS_IO_PACKAGE,
     SALLYS_IO_PACKAGE;
procedure LOUELLAS_PROGRAM is

   procedure P1 is
   use FREDS_INTEGER_IO;
      begin
      put (1+1);    -- Fred's "put"
      end P1;

   procedure P2 is
   use SALLYS_INTEGER_IO;
      begin
      put (2+?);    -- Sally's "put"
      end P2;

end LOUELLAS_PROGRAM;
```

It could be made even simpler than this.

These are some of the ways that Ada programs can be put together. We have only seen the outlines; the details can become almost microscopic.

Summary

In general, Ada programs can be assembled using either the *top-down* or the *bottom-up* method. The former approach employs *subprograms*—procedures and functions which may be overloaded as often as necessary. Subprograms may be broken down even further by separate compilation of the specification and body.

If the specification is included in another program unit it is called a *body stub*. Bottom-up programming is accomplished with general-purpose *packages*, used for grouping together related resources such as data and subprograms. Like other objects in Ada, packages may be declared as *generic* and used to create similar objects through the process of *instantiation*.

Program organization is the most important feature of Ada. In the future, complex programs will be assembled from Ada modules just as easily as a child builds a house out of wooden blocks. Libraries of software components will exist to satisfy every taste. Need a video game controller? Instantiate it. Your I/O routines are too slow? Here, try Fred's.

Ada will be a big part of the future. If you don't want to be left behind, get your hands on an Ada compiler and start writing programs.

Until next month, when we will evaluate two implementations of Ada for microcomputers, the Countess of Lovelace bids you Farewell! ☐

"Simply the best word processor...anywhere"

For the Apple™

No hardware additions needed — What you see is what you get. All functions are displayed on the screen exactly as they appear in print including:

- Underlining
- Bold
- Superscript
- Even/normal justification
- Lower and upper case
- Block movement
- Global replace
- Plus many more features

"Word Handler is simply the best word processing software I could find anywhere by far."
William R. Moroney
President
Electronic Funds
Transfer Association

Now Available!
List Handler
A mailing list program to work with the Word Handler (interfaces with VisiCalc™ and DB Master™) stores up to 3000 records per disk, unlimited sorting fields.

Word Handler

Once you buy a Word Handler we don't forget you; our customer service department is available daily. We support our products.

When upgrades are introduced you are supplied with a replacement disk FREE! Contact your local Apple™ dealer for a demonstration. You'll be glad you did.

Silicon Valley Systems, Inc. 1625 El Camino Real #4 Belmont, CA 94002 (415) 593-4344

CIRCLE 310 ON READER SERVICE CARD

Silicon Valley Systems

Accounting Plus II™

Plus…

Software Dimensions announces three new modules for Apple II* users with Accounting Plus II each designed with the same high standards and human engineering factors that have made Accounting Plus II so popular.

With **Invoices Plus** you can inventory items just by entering part numbers; easily invoice non-standard items and miscellaneous charges; place user defined comment lines on the invoice; get twice as many line items per invoice; automatically generate multiple pages; specify individual invoice numbers or assign them automatically — and more.

G L Plus expands your financial reporting capabilities, including changes in your financial position, offering even more flexibility for your General Ledger module. Typical reporting features include Budget/Prior Months' Listing, Income Statements, Balance Sheets, Budget Variance Report, Comparative Reports, Source and Use of Funds.

Labels Plus offers a versatile label package that lets you maintain one or more mailing lists with up to 1,000 names each, as well as to access existing Vendor and Customer files easily; add, edit and delete names; sort and select; print mailing labels.

You won't find this kind of flexibility and sophistication in any other Apple II accounting system. To find out more, contact your Accounting Plus II dealer.

Software Dimensions Inc., 6341 Auburn Blvd., Citrus Heights, CA 95610, 916/722/8000

*Registered trademark of Apple Computer Inc. Accounting Plus is a trademark of Software Dimensions Inc.

© 1982 Software Dimensions Inc.

CIRCLE 279 ON READER SERVICE CARD

Re-Discovering Level II

Robert Spahitz

Although Radio Shack has replaced its Model I computer with the Model III and Color Computer, I continue to use my Model I, and I suspect that many other people do, too.

This article is written specifically for those who still program on a Model I, Level II, but it may also be of use to Model III users and other programmers as well. It includes some simple programming techniques, a description of how to create an error which should not be (a bug in Radio Shack Basic...still extant in the Model III computer), a mini-review of Radio Shack's *T-Bug* and machine language, a mention of how to put control characters and arrows directly into text (inside PRINT statements for example), and an explanation of how to create sound without any extra peripherals.

Radio Shack Basic includes many unusual idiosyncracies that are rarely mentioned. For example, the Level II manual tells you that you should use THEN with all IF statements, when in reality, THEN is not needed in most cases, and in one case it is always needed. (THEN uses up one extra byte every time it is used, and it rarely makes the program any more understandable.)

If you are comparing only numeric data, THEN is usually needed only when the true part of the IF statement is an assignment with LET omitted. If you are comparing string data, THEN is always required for an ELSE clause to work; otherwise THEN is needed only if the dollar sign is omitted, because the variable being used is predefined in a DEFSTR clause (see Chart for examples).

Also, beware of hidden keywords when you program (Chart examples 12-16), especially when you are doing logical comparisons.

According to the Level II manual, INKEY$ "returns a one character string... the last key pressed." However, some keys do not work the way you might hope, specifically SHIFT, BREAK, and @.

Although there are two shift keys, they have no effect on INKEY$ unless pressed with another key. If that other key is @, program execution freezes. To have the program accept SHIFT @ as data, both keys must be pressed twice.

The other troublemaker is the BREAK key which almost always interrupts the program. To overcome this, POKE 16396,7 will disable the BREAK function and allow that key to act as any other key (CHR$(1)) until execution of POKE 16396,0. By placing these around input statements, you can prevent accidental BREAKing until after data input. Be sure to POKE into 16396 and not elsewhere, or you may not be able to recover your program.

Errors Or Not?

The INPUT statement, although useful, has several problems. If the variable is omitted after INPUT, no error will be picked up if the length of the input entered is zero before ENTER is hit. For example,

510 INPUT or 510 INPUT "HIT ENTER";

work fine if ENTER is hit immediately or if, as an example, HELLO and then five backspaces are typed before ENTER. Obviously this method of input is bad unless you know that the only input will be ENTER; otherwise the computer will try to store the information in the nonexistent variable, causing an error. Note: CLEAR can be used to replace backspaces.

Another INPUT problem has to do with the way data from the INPUT are interpreted. It affects both Model I and Model III, presumably because nobody at Radio Shack ever noticed this built-in error. When I first encountered this error, I thought there was a spelling mistake in my program line, because I was put into edit mode after a ?SN ERROR IN LINE xxx. When I listed the line, I saw nothing wrong, so I searched through the rest of my program. I still found nothing, so I ran the program again. After several tries, I found out that my input had caused the error.

Try typing the following program and RUNning it:

```
10 INPUT A
20 PRINT A
30 GO TO 10
```

Robert Spahitz, 143 Dewey Avenue, Staten Island, NY 10308.

Figure 1.

	Entering this input	Should give this response
example 1	5.0	5
example 2	5%	5
example 3	$5	?REDO
example 4	5.0%	?SN ERROR IN LINE 10

By typing any number, you will get either the number printed (or rounded off first) or an overflow if the number is too large. Typing non-numbers or combining numbers and nonnumbers usually gives a ?REDO or ?EXTRA IGNORED message. However, a certain combination gives ?SN ERROR IN LINE 10, and puts you in EDIT mode for line 10.

In example 1 of Figure 1, the computer interpreted the period as meaning floating-point. In example 2, % means integer. In example 3, $ is in no way numeric. In example 4, the computer got confused. If asked what interest rate you will be using in a program, example 4 is a likely response, but the computer picks it up as an error and makes you lose your last 30 minutes of typing.

This error is obviously in ROM because input to a program is not supposed to cause the program to bomb with a syntax error. What causes it?

As far as I know, this error occurs on all Level II and Model III computers whenever a period is followed by a percent symbol but before either a comma or a colon, and if the data is being put into any numeric variable (either directly through INPUT or LET, or indirectly by converting a bad string to numerics). That is, this error will occur if you try to put 5.%, -3.14159%, .1%234, .% or any similar combination into an integer, single or double precision variable, or a string variable of which the program will take the VALue.

Why does this error occur? Apparently, the computer interprets your input character by character after you hit ENTER. When it finds a period, it sets up storage for a floating point number. When it finds % it attempts to store the number as an integer. Since floating point numbers cannot be integers, the computer gets confused and claims that there is something wrong with your INPUT statement, LET statement, or VAL command.

How do I cure this problem? The only way I know to avoid it is to always use string inputs, either with INPUT or INKEY$, then edit out any % and other stray characters using LEFT$, MID$, and RIGHT$ (or do not allow stray-character input when using INKEY$), and finally convert the input to numeric data using the VAL command.

If you are really daring, you can create your own input routine using machine language. Two very useful tools for this are *How To Program The Z80* by Rodnay Zaks, Radio Shack catalog number 62-2066, $10.95 and *T-Bug*, Radio Shack catalog number 26-2001, $14.95.

How To Program The Z80 is a book that tells you exactly that. It has a listing of all Z80 instructions, tells how they work, and describes how to put them together with other instructions to create useful programs. Note: A working knowledge of Basic will help you better understand machine language instructions.

EPSON
MX-80 AND MX-100
OWNERS

MXPLUS™ GIVES YOU CONTROL OF YOUR PRINTOUT

- SELECT CONDENSED, **BOLD,** OR WIDE PRINT **INSTANTLY** USING THE PRINTER PANEL BUTTONS. (NO COMPUTER CONTROL CODES REQUIRED)
- ACTIVATE PERF-SKIP AND LEFT MARGIN INDENT TO **AUTOMATICALLY** FORMAT YOUR PRINTOUT INTO NEAT PAGES THAT CAN BE PUNCHED AND BOUND.

MXPLUS™ INSTALLS IN MINUTES, NO SOLDERING!

MXPLUS IS A PLUG-IN MODULE FOR ALL EPSON MX-80/100 PRINTERS AND IS COMPATIBLE WITH ALL INTERFACE BOARDS. MXPLUS HAS A 1 YEAR WARRANTY.

ORDER TODAY

ORDERS CALL 24 HR 800-835-2246 x441
INFORMATION CALL 213-969-2250

DRESSELHAUS COMPUTER PRODUCTS
BOX 929
AZUSA, CALIFORNIA 91702

ONLY
$49.95
POSTPAID CALIF. ADD 6%
SAME DAY SHIPPING
WITH MC/VISA

CIRCLE 183 ON READER SERVICE CARD

Celebrate
With Us
Have a prosperous
New Year with Software from CMA

APPLE II - APPLE /// - TRS-80 - IBM

CMA
Micro Computer Division
55722 Santa Fe Trail
Yucca Valley, CA 92284
(619) 365-9718

CIRCLE 134 ON READER SERVICE CARD

PETSPEED

Now for COMMODORE 64!

FAST ENOUGH FOR THE HUMAN RACE

Our alien won't hang around for slow software. He wants crisp responses and really fast processing.

For the human race too, slow PET BASIC is not good enough. When we run a program, whatever it is, we want fast efficient action.

PETSPEED, the compiler recommended by Commodore, is now available for the 64 and CBM 2. It can make any BASIC program run many times faster. It even speeds up disk handling. We guarantee that PETSPEED is easier to use and generates faster code than any other BASIC compiler for Commodore Systems.

Using PETSPEED is simple. Just type in the name of the program, wait a few minutes and then watch your software run up to 40 times faster.

Petspeed is not simply a compiler, it contains a powerful OPTIMISER. While PETSPEED is compiling, it breaks your program down into tiny fragments and reassembles it removing the unnecessary and simplifying the complex. Dazzling graphics. Lightning sorts. With PETSPEED anything is possible.

Also available INTEGER BASIC COMPILER — 150 to 200 times the speed of Basic. Integer Basic is for those applications where the speed of machine code is required without the inconvenience of assembly level programming. Ideal for scientific and educational users. Compatible with Petspeed.

PETSPEED (Commodore 64)	$150
PETSPEED (8000 or 4000 series)	$300
INTEGER BASIC (8000 or 4000 series)	$175
SPECIAL OFFER: Petspeed PLUS Integer Basic	$435

SSE (415) 964-0201
SMALL SYSTEMS ENGINEERING
1050 Elwell Court • Palo Alto, CA 94303

CIRCLE 314 ON READER SERVICE CARD

Educational Activities

P.O. Box 87 • Baldwin, NY 11510

Microcomputer programs written by teachers for classroom and home... easy to use... useful for all ages...full computer capabilities ...educationally sound.

We've been producing educational materials for 33 years, which gives us knowledge and expertise.

Now, that experience is reflected in our outstanding microcomputer programs - written by educators, field-tested with students, programmed by experts!

That advantage shows up in every single program we sell. Send for our catalog today!

Circle #

187

on your reader service card for our

FREE CATALOG!

- Reading
- Mathematics
- Spelling
- Language Arts
- Writing
- Social Studies
- Science
- Computer Literacy
- Keyboarding

- simulations
- games
- tutorial
- drill & practice
- management
- remedial & developmental

For the

Apple II
PET
Atari
TRS-80

Filmstrips for programming, debugging and career opportunities.

Educational Activities Inc.

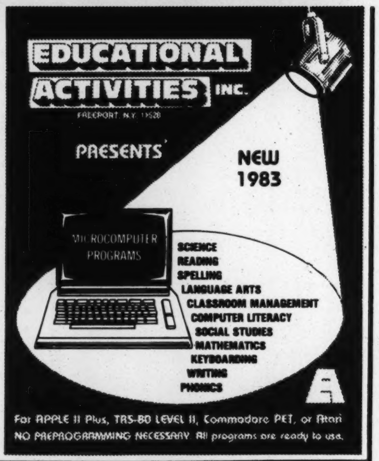
PO Box 87
Baldwin
NY 11510
(516) 223-4666

Thousands of programs now in use in schools, homes and businesses.

In Canada

Coronet Instructional Media Ltd.
200 Steelcase Road East
Markham Ontario L3R 1G2

Registered trademarks: Apple - Apple Computer Inc.; TRS-80 - Tandy Corp.; PET - Commodore Business Machines; Atari - Warner Bros.



EDUCATIONAL ACTIVITIES INC.
FREEPORT, N.Y. 11520

PRESENTS

NEW 1983

MICROCOMPUTER PROGRAMS

SCIENCE
READING
SPELLING
LANGUAGE ARTS
CLASSROOM MANAGEMENT
COMPUTER LITERACY
SOCIAL STUDIES
MATHEMATICS
KEYBOARDING
WRITING
PHONICS

For APPLE II Plus, TRS-80 LEVEL II, Commodore PET, or Atari
NO PREPROGRAMMING NECESSARY. All programs are ready to use.

When To Use 'THEN' In 'IF' Statements

Program Line	Works as Expected	Solution
1. IF A=B PRINT C	Yes.	
2. IF A=B C=5	No. Computer interprets B and C as one variable.	Use THEN after B.
3. IF A=B LET C=5	Yes.	
4. IF A=B*5 C=5	Yes!	
5. IF A=5*B1 C=5	No. Similar to number 2.	Use THEN after 1.
6. IF A$=B$ PRINT C$ ELSE PRINT	Yes, if A$=B$; No, if A$≠B$... ELSE clause disregarded.	Use THEN after B$.
7. IF A$=B$ C$="HI"	Yes.	
8. DEFSTR A,B:IF A=B PRINT C	Yes.	
9. DEFSTR A,B:IF A=B C=5	No. Same as number 2.	Use THEN after B.
10. DEFSTR A,B:IF A=B$ C=5	Yes. (A=B$ is correct)	
11. IF E=2 DISC=SQR(B ↑ 2-4*A*C)	No. New variable ISC is created and E is compared to 2D (double precision).	Use THEN after first 2.
12. IF A=T AND F=3 THEN STOP	Yes, *if* there is a space between the first T and the A in AND, otherwise interpreted as IF A=TAN...	Put space after T.
13. IF PM=SE THEN STOP	Similar to above: if space after first E is omitted, interpreted as IF PM= SET...	Put space after E.
14. FOR A=GO TO FINISH	NO! Does not work, even with spaces.	GO must be POKEd into memory; easier to change variable.
15. FOR A=AU TO LE	Only if space after U.	Put space after U.
16. PRINT TAUT OR LOOSE	Yes, with spaces, otherwise keyword AUTO gets in the way of this logical OR.	Put space before O.

Many are very similar to #16, so beware when logical ORing or ANDing.

Notes:

10. IF A=B$ C=5 is not an error.
11. This gave me different results, but the square root is not stored in DISC.
12-16. By leaving spaces after variables that effect the beginning of a keyword, most problems like this are resolved. For example, use =AU TO instead of =AUTO. This will not work when GO is next to TO because the computer disregards spaces, linefeeds and certain other CHR$ codes when trying to form the GOTO keyword.

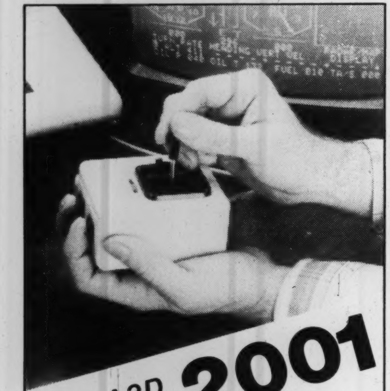
apple
Dist. by Bell & Howell
YOU CAN'T
BEAT OUR PRICES
(800) 368-3417
$999
Call for Everything

Disk II & Controller 495
Quentin Drives 325
Premium Pack 618
BMC Monitor 91
Amdek RGB Color II 795
Hays Apple Modem 289
SOFTWARE
Pascal 199
Visicalc 188
Wordstar 199
DB Master 179
Master Type 28
Wizardry 38
1500 Programs In Stock

TIMEX Computer 95
16 K Add On 45
COMMODORE VIC 20 199
Recorder ....69 16 K Mem. 104
ATARI 800 16 K 669
810 Disk ....569 Percom 699
MICRO DECISION 1149
KAYPRO II 1775
PRINTERS
NEC 3510 1389
IDS Prism .... $Call
Diablo 630 1739
MODEM AJ Triple 819

THE Computer Learning Tree
Government Sales
Call 703-750-2632
7023 Little River Tnpk.
Annandale, VA 22003

CIRCLE 165 ON READER SERVICE CARD



A2D JOYSTICK 2001
- QUALITY COMPONENTS
- PRECISION OPEN GIMBAL STICK (Designed for radio control use)
- TACTILE FEEL BUTTONS (Approx. life: 5 million presses)
- PLUG COMPATIBLE WITH APPLE ™
- DEALER INQUIRIES INVITED
- $44.95

A2D MICRO CO.
PO Box 6471 Greenville, S.C. 29606 Ph. 803 297 0552

CIRCLE 101 ON READER SERVICE CARD

COTTAGE SOFTWARE

PACKER: Machine language program that edits all or part of your Basic program to run faster, save memory, or ease editing. The 5 options include UNPACK—unpacks multiple statement lines into single statements maintaining logic inserts spaces and renumbers lines. SHORT—deletes unnecessary words, spaces, and REM statements. PACK—packs lines into maximum multiple statement lines, maintaining program logic. RENUM—renumbers lines, including all branches. MOVE—moves line or blocks of lines to any new location in program. On 2 cassettes for 16K, 32K, & 48K. For TRS-80™ Mod I or III Level II or Disk Basic............$29.95

SYSTEM TAPE DUPLICATOR: Copy your SYSTEM format tapes. Includes verify routines. The Model III version allows use of both 500 and 1500 baud cassette speeds.
For TRS-80™ Model I or III Level II..........$15.95

CASSETTE LABEL MAKER: A mini word processor to print cassette labels on a line printer. Includes 50 peel-and-stick labels on tractor feed paper.
For TRS-80™ Model I or III Level II & Printer .$17.95

PRINT TO LPRINT TO PRINT: Edits your Basic program in seconds to change all Prints to LPrints (except Print@ or Print#) or LPrints to Prints. Save edited version.
For TRS-80™ Model I or III Level II..........$12.95

FAST SORTING ROUTINES: For use with Radio Shack's Accounts Receivable, Inventory Control I, and Disk Mailing List Systems for Model I Level II. Sorts in SECONDS! You'll be amazed at the time they can save. Supplied on data diskette with complete instructions.
FAST SORT for Accounts Receivable......$19.95
FAST SORT for Inventory Control I........$19.95
FAST SORT for Disk Mailing List (specify data diskette cassette for 1 drive system)..........$14.95
ALL THREE ROUTINES..............$44.95

Prices subject to change without notice. Call or write for complete catalog. Dealer inquiries invited. VISA and MasterCard accepted. Foreign orders in US currency only. Kansas residents add 3% sales tax. On-line catalog on Wichita FORUM-80: 316-682-2113 Or call our 24 hour phone 316-683-4811 or write:

COTTAGE SOFTWARE
614 N. Harding Wichita, KS 67208

TRS-80 is a trademark of Tandy Corporation

CIRCLE 162 ON READER SERVICE CARD

Level II, continued...

T-Bug is a Radio Shack creation which allows you to write, edit, and execute machine language programs. It is loaded from cassette and accepts eight different commands.

Along with the *T-Bug* cassette comes a very handy reference manual that carefully explains each command, includes a Level I to Level II conversion program, lists all of the Z80 opcodes and their symbolic names (unfortunately, no description of the commands is included), pictures a memory map of both Level I and Level II memory, lists some useful ROM subroutines (such as getting a character from the keyboard, and using the cassette and printer), contains a conversion table for binary-hexadecimal-decimal numbers, and finally lists some books to read for more information about machine language.

All in all, *T-Bug* is very useful for the machine language novice, but a book on the Z80 is a must if you want to understand the Z80 commands. If you are serious about speeding up your programs and using less memory, $15 for *T-Bug* and $11 for a good book is very reasonable.

Control Characters in Text

Moving along, let us examine a useful aspect of Level II. Through use of the EDIT command, any control character from 1 to 27 can be sneakily stored into one byte instead of the usual four or five bytes needed to store CHR$(NN) where NN would be a number from 1 to 27. This is tricky but worth the effort if you enjoy conserving memory and confusing anyone who reads your listings. The procedure follows:

1. Type the line in which you want the code, leaving one space where it belongs.
2. Enter EDIT mode by typing EDIT line number ENTER.
3. Space up to and over (not past) the space to be changed (usually right after the first quotation mark).
4. While holding down the down arrow, type C and release only the C key.
5. Hold the shift key down.
6. Type the letter of the alphabet corresponding to the code you want printed (A=1 B=2 C=3...Z=26 ↑=27)
7. Release all keys and hit ENTER or E to exit EDIT mode and store the code.

This may sound complex, but it is rather easy once you do it a few times. Try the following example:

```
10 PRINT CHR$(23) "HELLO"
```

To convert the above, first type

```
10 PRINT "HELLO"
EDIT 10 (ENTER)
```

and space past the first quote. Now hold the down arrow key, depress and release the C for change, hold the SHIFT key and type W, the twenty-third letter of the

the PROGRAM STORE

Christmas Software Favorites

the PROGRAM STORE

LOST COLONY

By David Feitelberg from Acorn

You are the Economic Manager of the world's first space colony. The next support ship from Earth isn't due for another **15 years**, and you have instructions to make things go better or get out of office in shame. You must allocate labor, explore new territories, decide on production quotas, determine pay scales and taxes for the most productivity. You're armed with maps and charts. 10 levels of difficulty; "save the game" feature on disk.

Atari/IBM/TRS-80:
16K Tape or 32K Disk, **$29.95**

MASTERTYPE

From Lightning

Imaginative and fun, this "space typing" game will teach you the keyboard in SELF DEFENSE! The only way you can defend yourself against the letters coming at you from all corners of the screen is to press each matching letter quickly. As the pace picks up, they're flying so fast, ***there's no time*** to look at the keyboard—you'll ***have to*** learn it by heart!

Apple: 48K Disk, **$34.95**
Atari: 32K Disk, **$39.95**
IBM: 64K Disk

ZORK I, II, or III

From Infocom

You can communicate ***in complete English sentences*** in these interactive adventures, with a vocabulary of over 600 words! Each of these literate games will keep you entertained for 50 hours or more.

Zork I, The Great Underground Empire: Discover 20 treasures, and fight for your life! **ZORK II,** The Wizard of Frobozz: The Wizard will attempt to confound your quest with his capricious powers. **Zork III:** Brand New Adventure!

Apple: 32K Disk/**Atari:** 32K Disk/
IBM: 64K Disk, **$39.95 Each**

CRUSH, CRUMBLE AND CHOMP!

From Epyx

It's a monster movie, and ***you are the monster!*** You can be The Glob, Kraken, Mantra, Mechismo, Arachnis or Goshilla—or even design your own "custom" monster (disk version only). Hilarious action game, loaded with graphics and sound, as you practice your villany and avoid science, the police and the armed forces.

Apple: 48K Disk/**Atari:** 32K Tape or Disk/**TRS-80:** 16K Tape or 32K Disk, **$29.95**

VOYAGER I

From Avalon Hill

You're on board a spaceship infested with killer robots in this graphic science fiction game. You must clear the 4-level 144-location ship of robots and arm it to self-destruct. Can you do it and escape before you, too, are blown up? High-speed graphics are represented in 3-D perspective representing your eye's view; with instant switching to floor plan maps.

Apple: 48K Disk, **$24.95**
Atari: 32K Tape, **$19.95;** 32K Disk, **$24.95**
Color/TRS-80:
16K Tape, **$19.95**

CHOPLIFTER

From Broderbund

#1 Best Seller!

Can you rescue the hostages captured by the Bungelings? First you'll have to make careful plans for your helicopter rescue mission. But hurry—every minute counts! Who knows ***what*** the Bungelings have in mind? Requires joystick.

Apple: 48K Disk/**Atari:** 40K Disk, **$34.95**

SHOOTOUT AT THE OK GALAXY

From Avalon Hill

This exciting new game requires fast arcade response and well-thought-out strategy. ***Thirty alien warships*** have entered your Patrol Zone—can you handle your defense? Are your shields up? Have you checked your energy level? Is your azimuth set? OK then . . . ***Good Luck!***

Apple: 48K Disk, **$24.95**
Atari/Color/ TRS-80:
16K Tape, **$19.95**

CROSSFIRE

From On-Line

The most original, exciting arcade game—designed exclusively for the home computer—that we've seen! The aliens have taken over your city, and everyone left peaceably—***except you.*** You wander the streets, shooting at aliens firing at you ***from all 4 directions.*** You must move quickly to avoid their CROSSFIRE, gather bonus tokens, and recharge your laser. It's one of our favorites! Requires Joystick.

Apple: 48K Disk, **$24.95**
Atari: 16K Tape or 32K Disk, **$29.95;**
ROM Cartridge (16K), **$44.95**
IBM: 64K Disk, **$29.95**

FROGGER

From On-Line; Cornsoft

One of the most popular arcade games ever . . . now available for your home computer! Just as in the arcade game, you must dodge heavy traffic and jump the moving logs in the stream to get home. Fantastic graphics! Requires joystick.

Apple: 48K Disk, **$34.95**
Atari: 16K Tape or 32K Disk, **$34.95**
TRS-80: 16K Tape, **$19.95;**
32K Disk, **$22.95**

THRESHOLD

By Warren Schwader & Ken Williams

You, alone, can save the Earth Federation from the lawless aliens who roam our galaxy. Not only have these invaders been attacking our home planet—they're also raiding our space colonies! Space travel has become increasingly dangerous, as has friendly trade. But supplies must go through. As the pilot of the Federation fighter THRESHOLD, it's all up to you! High resolution graphics and sound plus "save the game" feature. Requires joystick.

Apple: 48K Disk/**Atari:** 40K Disk, **$39.95**
VCS: $22.95

POOL 400/ POOL 1.5

From IDSI

A remarkable action-simulation . . . it looks and plays ***just like the real thing!*** You can play several different types of pool at your choice of table speed with "instant replay" of any shot. Hi-res color graphics; requires joystick.

Apple: 48K Disk, **$34.95**
Atari: ROM Cartridge (16K), **$39.95;**
48K Disk, **$34.95**

WIZARD OF WOR

From Roklan

Can you defeat the WIZARD OF WOR? First you must descend into the ever-changing maze of Dungeons with your Worriors, and do battle with the monsters you encounter, like the Burwors, Garwors, Worluk and enemy Worriors. Only then can you turn your attention to the Wizard, who can teleport magically around the screen, hurtling lightning bolts as he moves. Simultaneous 1 or 2 player action.

Atari: 32K Disk. **$39.95;**
ROM Cartridge (16K), **$44.95**
VCS

VISA **For Information Call 202-363-9797** **To Order Call Toll-Free 800-424-2738** MasterCard

the PROGRAM STORE **4200 Wisconsin Avenue, NW, Dept.12-12-2 Box 9609**
Washington, D.C. 20016

Visit our other stores: Seven Corners Center, Falls Church, VA • W. Bell Plaza, 6600 Security Blvd., Baltimore, MD
829 Bethel Rd., Columbus, OH

THE PROGRAM STORE • Dept. 12-12-2 • Box 9609 • 4200 Wisconsin Avenue, NW • Washington, D.C. 20016

Item Computer Tape/Disk Price
____
____
____
____
____

Postage $2.00
Total ____________
☐ CHECK ☐ VISA
☐ MASTERCARD

Name______________________________
Address____________________________
City__________ State__________ Zip__________
Card #____________________ Exp__________

CIRCLE 278 ON READER SERVICE CARD

SUPER VALUES

MINI DISK TRAY

Store over 130 mini-disks in their protective jackets. Each plastic tray includes a smoke dust cover and six plastic movable index dividers.
SIZE: 6"x6"x12"
COLORS: Black or putty
ADD'L DIVIDERS: $4.95/6 pack.
PRICE: ~~$29.95~~ $24.95

apple software

GIN RUMMY: The APPLE is good in this superb HI-RES game! **$16.95**

OTHELLO: Nine skill levels makes this fast HI-RES game fun! **$17.95**

BLACKJACK: Up to four players can challenge the APPLE in this fast HI-RES game. **$14.95**

STATES & CAPITALS: Learn them with the aid of a HI-RES map. **$13.95**

MEMORIZER: HI-RES objects are used to challenge the players memories. **$15.95**

SPEED READING: Read it fast! It self-adjusts to your skills. **$14.95**

UPDATE 3.2/3.3: Your 3.2 disk is updated in seconds to boot on both 3.2 and 3.3. **$17.95**

VISIFORM: Lists VISICALC grid locations and their formulas. A MUST for VISICALC users! **$17.95** *

CATALOGUER: Organize your disk library by program name automatically! Sort, search, add titles, comments, etc. It includes a powerful editor! **$18.95** *

HI-RES DRAWING: Draw HI-RES screens from game boards to business charts. Has 50 different size brushes or define & use your own brushes! **$17.95**

HI-RES SHAPE GENERATOR: Create & EDIT shape tables for use in your programs. It's easy to use! **$15.95**

CONCENTRATION: Challenge your memory in this beautiful HI-RES card-matching game! **$10.95**

BACKGAMMON: Strategy & odds makes this a great HI-RES game. **$16.95**

ROYAL CASINO: A HI-RES card game of considerable math skill. Great! **$15.95**

STUD POKER: You VS the APPLE in a HI-RES gambling game. It's fun! **$15.95**

CRIBBAGE: Six-card version in beautiful HI-RES. **$15.95**

UTILITIES I: Includes: AUTO-MENU, Sort Catalog, Change Volume Name and Short DOS Commands. **$16.95**

WORD SEARCH PUZZLE: Find the hidden word before time runs out. It's educational & fun! **$14.95**

SCRAMBLED WORDS: Clues help you to unscramble them in this timed educational game. **$14.95**

* Specify DOS 3.2 or DOS 3.3.
All programs are on disk.
Applesoft is required.

FREE SHIPPING
send check or money order to:

SoftwareLand

Tamiami Mall
8774 S.W. 8 Street
Miami, Fla. 33174
(305) 551-1111

CIRCLE 324 ON READER SERVICE CARD

Level II, continued...

Listing 1.

```
10 FOR Z = 1 TO 25
20 A = RND(300) - RND(600)
30 B = RND(300) + 300
40 C = RND(25)
50 D = RND(RND(9))
60 E = RND(RND(9))
70 GOSUB 100
80 NEXT Z : REM MAKE SOUND AGAIN
90 END
100 FOR Y = A TO B STEP C
110 OUT 255,0
120 FOR Z = 0 TO D
130 NEXT Z : REM DELAY
140 OUT 255,4
150 FOR Z = 0 TO E
160 NEXT Z : REM DELAY AGAIN
170 NEXT Y : REM REPEAT CLICK
180 RETURN
```

Listing 2.

```
10 OUT 255,8 : REM CHANGE SCREEN TO
   32-CHARACTER MODE
20 PRINT "T Y P E   A ,   B   O R
   C"
30 A$ = INKEY$
40 IF A$ < "A" OR A$ > "C" THEN 30
50 IF A$ = "A" PRINT "STOP" : STOP
60 IF A$ = "B" PRINT "END"  : END
70 PRINT "END OF PROGRAM"
```

alphabet. If you do not hold the down arrow or type it after the C, your results will not be the same, so do it in the proper order. The down arrow somehow affects the TRS-80 character generation section, so by holding this down with other keys you will produce other characters.

This leads me to my next trick: producing arrows directly in text. This is much simpler than inserting control characters into text and is probably more useful. There are several ways to do this. I find this way easiest:

First depress and hold the Z and 2 keys, then backspace twice to erase the Z and the 2.

Then Press	To Get
3	↑3
4	↓4
5	←5
6	→6
7	_7

Finally, backspace once to erase the number, and you end up with the arrow. No EDIT mode was needed. Note: Sometimes the number comes before the arrow. In that case, just erase the arrow and the number, and try again.

Sound Too?

Finally, I have discovered that the TRS-80 can produce sound without any new software, hardware, or even a speaker. Although you do not get a symphony, you do get hums, buzzes, and clicks. There seems to be a flip-flopping device inside the keyboard that controls cassette input/output. By making it flip-flop at different speeds, you can produce several sounds directly from the keyboard. Since this device directly affects the recorder, it is wise either to turn off the cassette or to unplug the leads before attempting to make sounds.

The command to make sound is the infrequently used OUT statement. See Listing 1 for a sample program. By changing the delays in lines 120 and 150, or by changing the values in line 100, different sounds are produced.

The OUT statement can also be used to change the screen from 64-character mode to 32-character mode or vice versa, but it does this only during program execution. When the program stops, the screen reverts to its original mode. As a programmer, I find this useful because I can run my program in 32-character mode, and when I want to stop and list my program, I do not have to clear the screen, thereby losing any output I may have wanted to examine.

Try the sample program in Listing 2 to see how this works. Some problems do arise with this method, but they are minor. First, if CLS is encountered, OUT 255,8 must be re-executed. Second, all PRINTs that contain literals (anything inside quotes) must be spaced properly to appear on the screen correctly (see line 20 in Listing 2).

Summary

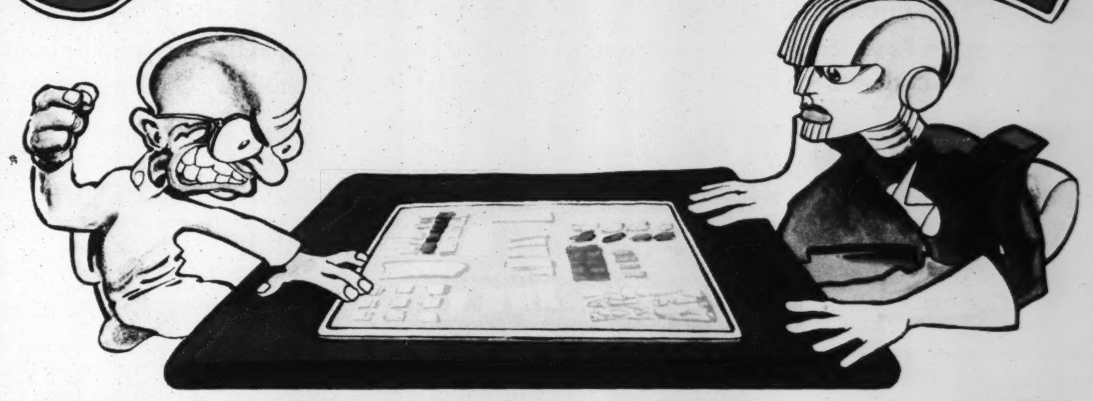
- THEN is not usually needed, but should be included when the true part of IF statement is an assignment, or if strings are being compared.
- INKEY$ does not accept SHIFT as a single character; you must type SHIFT-@ twice to store it; you must disable the BREAK key to be able to store it (POKE 16396,7).
- INPUT does not need a variable, but if you omit it, the only acceptable input is ENTER; if INPUT is used with numeric variables, or the program takes the VAL of a string, the program will bomb if the input contains a period followed by %.
- The EDIT subcommand C can be used to get control characters to be stored directly in text.
- By holding down the 2 and the Z keys, you can get arrows or an underscore directly on the screen by typing 3, 4, 5, 6 or 7.
- Sound can be produced by switching from OUT 255,0 to OUT 255,4 and back, and including delays between them.
- OUT 255,8 will convert to 32-character mode during program execution as long as CLS is not encountered, and stay in that mode until the program is stopped.

I hope you have found these items useful and will include them to make your programs more efficient and, ultimately, more exciting.

If you have questions or comments, I would be pleased to read and respond to any that contain a self-addressed envelope. ☐

Can you beat the hazards of...

COMPUTER·RAGE



Here's the acid test for your computer strategy skills!

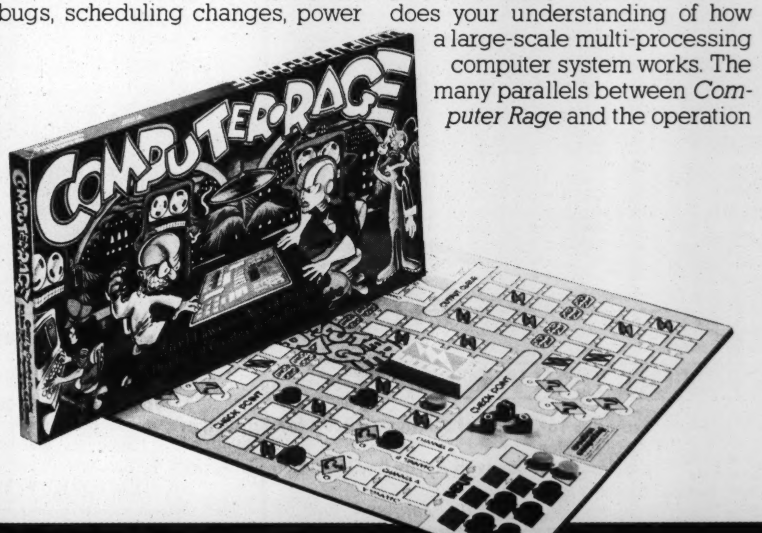
Here's a demanding new board game—the toughest computer game you'll ever play. It's guaranteed to provide you and your friends with hours of competition and playing fun!

The object of *Computer Rage* is to move your three programs from "Input" to "Output" before the other players can. Moves are determined by the roll of dice which give you a 3-bit binary number. Simple enough—until you begin to encounter the hazards: program bugs, scheduling changes, power and program failures, priority interrupts.

The trick is to overcome the hazards and keep your programs moving toward the Output end of the board. "Efficient Programs," "Interrupt Override," "Advantageous Scheduling Changes" and other Interrupt cards help you beat the hazards.

The outcome of any game of *Computer Rage* is a matter of probability, luck and skill. As you play, your ability increases—and so does your understanding of how a large-scale multi-processing computer system works. The many parallels between *Computer Rage* and the operation of a multi-processing computer system are explained in a specially prepared supplement to the rules.

Computer Rage can be played by two to four players, ages ten to adult. Notes for using the game in school have been included. *Computer Rage* comes with a colorful board, 12 program playing pieces, 3 binary dice and 38 Interrupt cards. Only $8.95!



creative computing

Dept. CD2A, 39 East Hanover Avenue
Morris Plains, NJ 07950

Send me ________ *Computer Rage* games at $8.95 each, plus $2 postage and handling per order ($3 additional for foreign orders shipped air mail only.) **#6Z**

☐ **Payment enclosed** $________ (NJ residents add 5% sales tax.)

☐ **CHARGE MY** ☐ American Express ☐ MasterCard ☐ Visa

Card No. ________ Exp. Date ________

Signature ________

Print Name ________

Address ________ Apt. ________

City ________

State ________ Zip ________

☐ **Check here for FREE catalog.**

For faster service:
PHONE TOLL FREE: 800-631-8112.
Please have ad in hand when ordering.
(In NJ call 201-540-0445.)
Institutions only:
Purchase orders under $50 not accepted.

As we celebrate our first anniversary, Gold Disk™ wishes to say *THANK YOU* to the thousands of Apple™ users that have taken advantage of our buying opportunities and service features. Gold Disk™ also thanks the hundreds of vendors and publishers that stand behind us and support our customers.

Gold Disk™ is meant to be the highest quality telemarketing/mail order experience available for the Apple™ user. We are constantly upgrading our catalog of products and improving our level of service.

You can (occasionally) find lower prices. You cannot find a higher order of professional commitment or dedication to serving its customers than Gold Disk™.

To celebrate our first year anniversary we are offering a number of specials on selected products. Call Gold Disk™ for quotations toll-free 1-800-368-2260 (in Maryland 592-5949).

Congratulations To Four More Software Winners From Our Free Drawing at the Boston Applefest:

P. Di Bara, Massachusetts J. Bierly, New Jersey R. Bailey, North Carolina G. Omer, Florida

Gold Disk™

APPLE SOFTWARE
APPLE ACCESSORIES
CALL TOLL FREE

For specific software not listed, CALL 1-800-368-2260

FREE DATA DISK WITH EVERY $40 PURCHASE!

Free Catalog.

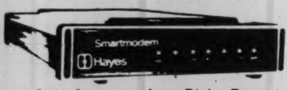
Look over the list of product lines we carry and call us when you need a quote on a specific product.

Info Unlimited,
Easywriter (PRO)

Microsoft Z-80 Softcard
Microsoft 16K Ramcard
Videx Videoterm

Corvus
SOFTWARE

Smartmodem

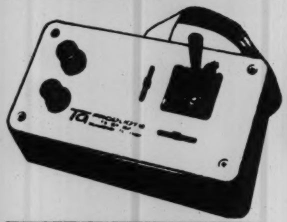


- Auto-Answer • Auto-Dial • Repeat
- Programmable - Use Any Language
- Touch-Tone and Pulse Dialing
- Audio Monitor - Listen to Connection
- FCC-Approved Direct-Connect
- Full or Half Duplex, 0-300 Baud
- RS-232C Interface • 7 Status LED's
- Two Year Limited Warranty

Just some of the software in stock NOW–
Magic Window, Raster Blaster, Ultima, Home $ Minder, Tax Preparer, Pool 1.5, Typing Tutor, Olympic Decathalon, ABM, Robot War, Castle Wolfenstein, Cranston Manor, Expediter, OO-Topos, Cyborg, Gorgon, Falcons, Wizardry, Personal Filing System, PFS: Report, Flight Simulator. . .

TG Products

JOYSTICK



OTHER BRANDS IN STOCK:
Accent, Adventure International, Astar, Auto. Sim., Avalon, Avant-Garde, Beagle CPU. Datasoft, Delta, Edu-Ware, Info Com, Lazer, LJK, Phoenix, Quality, Sensible, Sentient, Sirius, Strategic, Synergistic and United.

*APPLE IS A TRADEMARK OF APPLE COMPUTER INC

```
WE ALSO CARRY I.B.M. EXPANSION CARDS,
SERIAL CARDS, AND OTHER ACCESSORIES...
Call to inquire about specific products

This month we are featuring specials on
MICROTEK 16K BAM-16 Memory Expansion
Boards, VIDEX Videoterm Boards,
LEADING EDGE Elephant Memory Disks,
and KENSINGTON System Savers...

Call 1-800-368-2260 (In Md. 592-5949)
```

APPLE SOFTWARE
APPLE ACCESSORIES
CALL TOLL FREE

TOLL FREE ORDER
1-800-368-2260 (In Maryland, Call 592-5949)

For specific software not listed, CALL 1-800-368-2260

TRADE THIS: /SS /IC / F$ /E " !
(Multiple strokes)

FOR THIS: SAVE | Insert Column | Format $ | EDIT | Label | RECALC
(Single stroke)

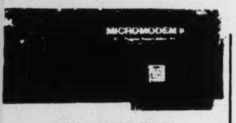
KEY WIZ™

BREAKS THE KEY/CODE BARRIER

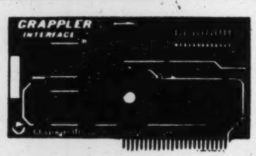
- A plug in keyboard relief to Visicalc* users

*Visicalc is a registered trademark of Personal Software
*Apple II is a registered trademark of Apple Computer, Inc

HAYES MODEMS



MOST ORDERS SHIPPED WITHIN ONE BUSINESS DAY



The most intelligent Apple Interface available. EPROM chip makes high-resolution graphics easy. Versions to accommodate the Anadex, Epson Series*, IDS Paper Tigers, Centronics 739, NEC 8023, C. Itoh Prowriter, Okidata Series* and more.

*Requires Graphics Upgrade.

Attach SYSTEM SAVER to your Apple II

RanaSystems

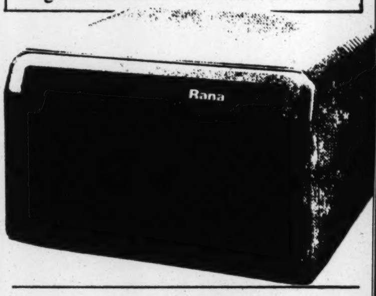
Your Apple computer can grow from ordinary to awesome in a matter of minutes.

The Elite disk drive Series by Rana Systems *gives* you that kind of magic. Quickly, easily and cost-effectively.

This superb family of sophisticated floppy drives was designed and perfected by a team of industry-respected engineers expressly for Apple® computer owners who have long been demanding more disk drive for their money.

Now they *have* a drive that makes an Apple perform the way it should. For example;

Elite One, the most economical Rana drive, delivers 15% more storage capacity than Apple's drive. The top-of-the-line Elite Three will provide an astonishing *four-times* more storage, approaching hard disk performance. It's done through exclusive high-density single and double-sided disks and heads.



GOLD DISK™ Software
Box 102
Glen Arm, Md. 21057
TOLL FREE 1-800-368-2260

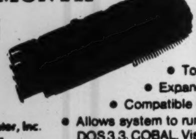
VISA MasterCard

THANK YOU.

SPECIAL OF THE MONTH

16K Ramcard

100.00



ONE FULL YEAR WARRANTY

- Full 1 year warranty
- Top quality — gold fingers
- Expand Apple II 48K to 64K
- Compatible with Z-80 Softcard™
- Allows system to run with CP/M™, PASCAL, DOS 3.3, COBAL, Visicalc, etc.

Provides 16K bytes of additional RAM for Apple II or Apple II Plus.
Designed for use with Apple II with 48 bytes of RAM already in place.

1-800-368-2260 (In Maryland, Call 592-5949)

Visicalc is a trademark of VisiCorp.
Z-80 is a trademark of Zilog, Inc.
Apple II is a trademark of Apple Computer, Inc.
Softcard is a trademark of Microsoft Inc.

*APPLE IS A TRADEMARK OF APPLE COMPUTER INC.

CIRCLE 200 ON READER SERVICE CARD

Pilot Tutorial II

Mike Smith

Last month in "Pilot Tutorial I," the type, match and accept instructions were introduced. This tutorial provides more details on those instructions. Some of the forms of the commands are particular to the Pilot to Basic convertor which appeared in the October 1982 issue of *Creative Computing*. However, most Pilot implementations will have commands to equivalent things.

Extending The Type (T:) Instruction

When writing a lesson you often need many display functions in addition to typing individual lines. You need to clear the screen, decide where to put your text, and add emphasis to what you say.

Clearing the screen and then typing a line is achieved by the screen clear command TC:

```
TC:THIS LINE WOULD APPEAR AT THE TOP OF THE SCREEN
```

Moving the cursor down the screen is achieved with the vertical tab command TV:, followed by a number between 1 and 20.

```
TV:5   Move the cursor to the 5th line on the screen.
```

Emphasis can be achieved by typing a line in *inverse* (i.e. black letters on a white background) using the command TI:

```
TI:THIS LINE WOULD BE IN INVERSE.
```

Further emphasis can be acheived by combing the TI: command with TH: which deletes the carriage return at the end of the line.

```
TH:PART OF THIS LINE WOULD BE IN

TI:INVERSE
```

The Type-and-Hold command (TH:) can be used to get the student's answer on the same line as the question asked. This makes for a much tidier, and therefore more readable screen.

```
TH:WHAT IS YOUR NAME?

A:
```

Extending The Accept (A:) Instruction

In the previous tutorial we showed how to accept a student's answer.

```
T:WHAT LESSON DO YOU WANT?

A:
```

This answer could then be used in a match instruction to be compared with what was expected.

In many cases however, the instructor is more interested in reusing the student's response than in checking it. For example, you might want to use a student's name later in a lesson. In this case you need to store it.

```
TH:WHAT IS YOUR NAME?

A:$N1$

M:FRED

T:HI THERE $N1$

TN:WHERE'S FRED?
```

In this program, the student's answer is stored in memory under the label **$N1$**. The student's answer is then compared to FRED in the match instruction. Next, the student's name is reused in a type statement to make the computer response more friendly. Finally the last line tries to find out where FRED is if FRED has not signed in.

The student's answer can be stored using any name. The

Dr. Mike Smith, 304, 86th Avenue SE, Calgary, Alberta, Canada T2H 1N7.

name must start and end in a $ each time it is used. A caution must be expressed however. The Pilot to Basic translator described earlier turns the Pilot lesson into a Basic program. This means that the part between the dollar signs must be a valid Basic name. On the Apple, you can use two letters or a letter followed by a number. Longer names can also be used, but the Apple will not know what to do with the extra letters. It will ignore them unless they happen to form a Basic language word, in which case it complains (SYNTAX-ERROR). Other versions of Pilot may impose other restrictions.

Using longer names, however, makes things much easier to understand. For example, which program better shows what is happening?

```
T:WHAT IS YOUR NAME?

A:$N1$
```

or

```
T:WHAT IS YOUR NAME?

A:$NAME$
```

To me the second version is so much clearer that I recommend using longer and more descriptive names even if an occasional problem crops up. However, while learning Pilot keep to the simpler names. These are the problems to look out for:

The dreaded siamese twin names. Most Basic translators of Pilot consider only the first two letters of a name to mean anything. You can type more than two letters in a name, but they are ignored. This means that names can look different but be the same. For example $N1$, $N10$, $N100$, and $N1000000$ are all equivalent to $N1$, and $STUDENTS$, $STRENGTHS$, and $STAR$ are all equivalent to ST.

The hidden Basic command. This is a name that has hidden inside it a Basic command. Some examples of hidden names are $LONG$, which contains the Basic command ON; $LENGTH$, which contains the command LEN; and $VALUE$, which contains the command VAL.

This is the same problem that Basic program writers suffer. To avoid it, simply use names that start with a letter followed by a single number. Use the longer names, knowing that occasionally you will have to go back and change. You will quickly find which of your favorite words cause problems.

Extending The Match (M:) Instruction

In the same way that the accept and type instructions can use a stored name, so can the match instruction.

```
*:START

T:TYPE IN THIS SERIES OF LETTERS  6THGFD34$$%

R:TYPING SKILLS TEST

A:$TEST$

T:TRY AGAIN

A:

M:$TEST$

TY:YOU DID THE SAME THING BOTH TIMES

E:
```

The Link (L:) Instruction

This allows one Pilot lesson to call another. It is used to connect separately written Pilot lessons into one longer lesson. Thus team authoring and modular courseware development become practical.

L:NEXT LESSON would cause the lesson named NEXT LESSON to run.

INCREDIBLE SPECIAL

Apple* Cannonball Blitz only $20.95
(retail 34.95)

OR

IBM* Zork II only $23.95
(retail 39.95)

OR

Atari* Temple of Apshai (32K Cass) only $23.95
(retail 39.95)

with any other purchase

Of course we're just as proud of our regular prices. And if you don't see what you want here, please call us and ask for it, or write for our free catalog.

APPLE*

	Retail	Only
Screenwriter II	129.95	99.95
Ulysses	34.95	27.95
Castle Wolfenstein	29.95	23.95
Graphics Magician	59.95	47.95
Wizardry	49.95	39.95
Word Handler	199.95	159.95
Knight of Diamonds	34.95	27.95
MasterType	39.95	31.95
Time Zone	99.95	79.95
Snack Attack	29.95	23.95
Borg	29.95	23.95
Cranston Manor	34.95	27.95
Apple Panic	29.95	23.95
Ultima	39.95	31.95
Ultima II	54.95	43.95
Atlantis	40.00	31.95
Deadline	49.95	39.95
Pinball (A2 PB1)	29.95	23.95
Microwave	34.95	27.95
Electric Duet	29.95	23.95
Kabul Spy	34.95	27.95
Swashbuckler	34.95	27.95
Minotaur	34.95	27.95
Choplifter	34.95	27.95
Frogger	34.95	27.95
Bag of Tricks	39.95	31.95
Marauder	34.95	27.95
Star Blazer	31.95	31.95
Cannonball Blitz	34.95	27.95
Dos Boss	24.00	19.20
Utility City	29.50	23.60

APPLE*

	Retail	Only
Zoom Graphics	39.95	31.95
Apple Speller	125.00	99.95
Microteck Bam (16K)	120.00	97.95
Microsoft Ram (16K)	195.00	155.95
Microsoft Softcard	395.00	315.95
Microsoft Prem. Sys.	775.00	619.95
System Saver (Fan)	89.95	71.95
Verbatim Datalife (10)	40.00	26.95
Home Accountant	74.95	59.95
PFS Filing System	125.00	99.95
Wordstar (softcard)	375.00	299.95
General Manager	149.95	119.95
D.B. Master	229.00	179.95
VisiCalc 3.3	250.00	199.95

ATARI*

	Retail	Only
Canyon Climber D16K	29.95	23.95
Preppie (Cass)	24.95	19.95
Centipede Cart8K	44.95	35.95
Raster Blaster D16K	29.95	23.95
Caverns of Mars D16K	39.95	31.95

IBM*

	Retail	Only
Home Accountant +	150.00	119.95
Visicalc	200.00	159.95
Supercalc	295.00	235.95
Deadline	49.95	39.95
Temple of Apshai	39.95	31.95
Curse of Ra	19.95	15.95

Our Guarantee: If it doesn't boot, we will replace it free...

1-800-845-5147

Hours: Mon. thru Sat., 9-9

VISA MasterCard

We accept
Visa or MasterCard
Checks (allow 2 weeks)
Money Orders
C.O.D.

Add $2.00 for shipping & handling
$2.00 extra if Blue Label
$3.00 extra if C.O.D.
SC residents add 4% sales tax
Prices subject to change and availability.

IBM is a trademark of International Business Machines
Apple is a trademark of Apple Computer Co
Atari is a trademark of Atari

FREE CATALOG

SOFTWARE CITY INC.™

Software City Inc
PO Box 12283
Columbia South Carolina 29211
803 736-1683

CIRCLE 321 ON READER SERVICE CARD

The User (U:) Command

In many lessons, the instructor needs to repeat an instruction many times. Rather than continually retyping that part of the lesson, the user Instruction can be used. For example, suppose that after typing some information for the student you want to pause until the student is ready. The lesson might look something like this

```
*:START
R:FIRST TEXT PAGE
...
...
U:PAUSE
R:SECOND TEXT PAGE
...
...
U:PAUSE
R:ETC
...
...
E:END OF MAIN LESSON
*:PAUSE
T:
TH:TYPE RETURN TO CONTINUE
A:
E:
```

When the program reaches the U:PAUSE command, it stops that part of the lesson and uses the lesson part called PAUSE. When it has finished PAUSE, it jumps back to where it came from and continues the lesson until it reaches the next U: command.

You should notice that the user routine starts *after* the end (E:) command that shows the end of the main lesson. At the end of the user routine there is a second end command. You need an E: at the end of the main lesson and, if you are using user commands, an E: at the end of each user lesson part to separate them.

The Basic (B:) Instruction

Most of the time, the simple Pilot commands are sufficient. Occasionally however, it would be nice to do something else. This command allows any valid Basic command to be included into a program.

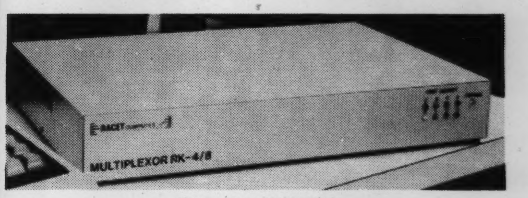
Probably the most useful Basic command in Applesoft is the one to control the speed at which the text is printed on the screen. People used to computers like the information to appear on the screen instantly, all at once. Students in my classes appear to prefer the words to appear more slowly. The command B:SPEED 100 will slow the print speed down. High numbers (up to 255) give a faster print. However, once the students are familiar with the computer, they like things to go faster. The problem is how fast? The following PAUSE user routine shows how to use the Basic statement to control the speed of the text printing using the paddles

```
*:PAUSE
TH:PRESS RETURN TO CONTINUE
A:
B:SPEED = PDL(0)
E:
```

SYSTEM SOFTWARE RACET COMPUTES = SYSTEM SOFTWARE RACET COMPUTES = SYSTEM SOFTWARE RACET COMPUTES = SYSTEM SOFTWARE RACET COMPUTES = SYSTEM SOFTWARE RACET COMPUTES = SYSTEM SOFTWARE

Get The Most From Your NEC PERSONAL COMPUTER With RACET COMPUTES Software and HARDWARE!!!

★ ★ ★ ★ ★ NEW - NEW - NEW - NEW - NEW - NEW - NEW ★ ★ ★ ★ ★ ★



RACET RK-4/8 MULTIPLEXOR

Schools — Businesses — Word Processing!!! The RACET MK4/8 Multiplexor allows multiple users to share the same mass storage, whether it is floppy disk or the RACET Hard Disk. The Multiplexor is fully supported under the RACET 'Everything' DOS. Users can work in mixed ROM BASIC and CP/M Call Compatible modes. All users can request information and be writing to the disk simultaneously. The multiplexor not only provides a cost-effective solution to users requiring multiple computers, but also provides the power of sharing data.

4-Port Mux $745 **8-Port Mux $945**

CALL FOR LOWEST HARD DRIVE PRICES FOR NEC

RACET NECDOS FOR YOUR PC-8000 AND PC-8800!! THE 'EVERYTHING' DOS!!! $225

Has ROM BASIC mode. Has CP/M★ compatibility mode. Works in both modes with the RACET RK 4/8 Multiplexor for shared disk environment. Supports the RACET Hard Disk in both modes and optionally with the Multiplexor.

RACET NECDOS does more for your PC-8001 than any other DOS. It's faster, more efficient and easier to use. It's loaded with extra features to let you stretch the limits of your system.

EMPHASIZES INTEGRITY. NO MOUNT or REMOVE commands. Excellent protection from improper diskette swapping. File password protection.

ADVANCED FEATURES. All DOS functions and commands may be used directly in a BASIC program!!! Special RUN option allows merging of programs, retaining all variables in memeory. Fixed block spanned records. AUTO and DO commands. Machine language loads and saves. MATPRINT and MATINPUT to disk. Complete directory. All supervisory calls documented and available to the machine language programmer. Superzap and other extensive utilities.

★ NEW ★ ELECTRIC PENCIL★ ★ ★ $99.95

THE most popular Microcomputer Word Processor in the world now available on the NEC!!! With many added features. Embedded print commands. Print from memory and disk!! Settable tabs. Indent and hanging indent. Parallel, Serial, and Video drivers. DICTAMATIC cassette control for translating dictated messages!! And much more!!! Most features of word processors costing five times as much!!! Runs on 32K or 64K system!!! Works in multi-user environment with the RK4/8 Multiplexor!!!!

★ NEW ★ ELECTRIC SPREADSHEET ★ ★ $75

A BASIC Spreadsheet program for the PC-8001. Anything you work with columns and rows and a calculator belongs on the Electric Spreadsheet. Results formatted for screen or printer. 'What if' questions answered. P/L forecast. Personal budget. Real estate investment. Net worth forecast. Cash flow estimates. Business forms. Works on 32K or 64K system!!! 70 operators plus histogram plot, revise spreadsheat layout, and more. Select preprogrammed operators for line, column, or cell calculations. Set column widths and number of decimals. Manual and diskette include 22 examples.

★ NEW ★ ADVANCED PROGRAMMING BASIC ★ ★ $60

THE functions and commands in this package give you extended control over data and your PC-8001 system. These extensions to NBASIC provide complete conversion of time and date functions including days between dates and Julian dates. Extended string functions include justify, truncate, center, rotate, translate, shift, pack, and search. Array functions include masked search of both sorted and unsorted arrays, and insert in sorted arrays.

MULTI-KEY SORT "MKS" $60

SUPER FAST Machine Language In-Memory Sorts. Three key sort on 500 elements in 4 seconds!!! Simple one-line BASIC functions - SORTV and SORTC VERBS. Mixed ascending and descending keys.

BASIC PROGRAMMING UTILITIES 'BASUTIL' $60

COMPRESS, EXPAND, PRETTY, XREF Cross Reference Utility. Great for modeling, debugging and structuring BASIC programs.

KFS-80 KEYED FILE SYSTEM 'KFS-80' $150

MACHINE language BASIC ISAM utility provides keyed and sequential access to multiple files. Simple interface to BASIC. Binary tree keyed-file index system provides rapid access to records.

CONVERT TRS-80★ PROGRAMS TO RACET NECDOS WITH 'PROTRAN' $99.95

COMPLETE utilities for file transfer and BASIC program conversion, MOD III diskettes may be read directly; MOD I and II via RS-232. Transfer BASIC programs, data files, or machine language files. NO SUPPORT is provided for conversion of machine language files or PEEK's, POKE's or USR's to function on PC-8001. Substantial knowledge of TRS BASIC and NBASIC required. Package designed for software authors.

AVAILABLE FROM YOUR LOCAL NEC DEALER or from RACET computes

CHECK, VISA, M/C, C.O.D.,
PURCHASE ORDER
Telephone Orders Accepted
(714) 997-4950

RACET COMPUTES LTD.
Integrity in Software
1330 N. Glassell, Suite M, Orange, CA 92667 (714) 997-4950

★ TRS-80 IS A TRADEMARK OF TANDY CORPORATION
★ CP/M IS A TRADEMARK OF DIGITAL RESEARCH
★ ELECTRIC PENCIL PENCIL IS A TRADEMARK OF MICHAEL SCHRAYER
★ ELECTRIC SPREADSHEET IS A TRADEMARK OF DAN G. HANEY & ASSOCIATES

CIRCLE 290 ON READER SERVICE CARD

NEW APPLE® UTILITIES FROM BEAGLE BROS

And a Game Disk Too!

S.
L.
RESET
T.
C.
APPLE 0

NEW!

Alpha Plot

Hi-Res Graphics/Text Utility by Bert Kersey & Jack Cassidy

Here are a few of Alpha Plot's useful graphics features. Compare with other graphic utilities at any price—

HI-RES DRAWING: Create hi-res pictures and charts with text, on both pages; all Optional Xdraw cursor (see lines before drawing). Mix colors & Reverse (background opposite). Circles, Boxes, Ellipses; filled or outlined. **Compress Hi-Res to 1/3 disk space.** Relocate any portion of an image anywhere on either page. Superimpose too & convert hi-res to lo-res for colorful abstracts!

HI-RES TEXT: Beautiful upper/lower case with descenders (no hardware required). Color and reverse characters positionable anywhere (no vtab/htab limitations). Professional-looking **proportional spacing** and adjustable character height and letter spacing. Sideways typing for graphs too!

$39.50

☐ Unprotected disk (48K min.)
☐ Beagle Bros Apple Tip Book #4
☐ Peeks & Pokes Chart

CHR$(7)
EARLY SPEECH SYNTHESIZER:

NEW!

Beagle Bag!

12 Games on One Big Disk by Bert Kersey

Twelve great games from our classic Beagle Bros collection—TextTrain, Slippery Digits, Wowzo, Magic Pack, Buzzword... Almost all of our "Game Pack" games have been updated and re-released on one jam-packed unprotected disk! **ALSO INCLUDED** is our "Beagle Menu" greeting program (description under "Typefaces" disk on this page).

Compare Beagle Bag with any 1-game locked-up disk on the market today!

All 12 games are a blast, the price is right, the instructions are crystal clear, AND the disk is copyable! You can even list the programs to see what makes them tick!

$29.50 Unprotected. Paddles NOT required. Beagle Menu works with all normal-DOS disks. Includes Peeks/Pokes Chart.

NEW!

Frame-Up

Graphics Display Utility by Tom Weishaar

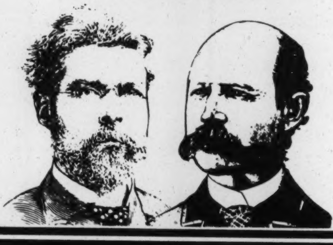
Frame-Up is a very-high-speed Apple "slide projector" utility that lets you create professional-looking displays of intermixed hi-res, lo-res and text pages **on any Apple.** Frame-Up is very easy-to-use and above-all **FAST,** allowing you to load hi-res pictures, for example, in **2½-seconds;** that's five-times faster than normal! Paddles or keyboard are used to change images in forward or reverse order, skipping pages if you want. OR presentations may be left unattended, with **each page individually timed** to appear and remain on the screen from 3 to 99 seconds, as you choose.

Frame-Up includes a sophisticated black and white **text screen editor** that lets you create text "slides" as part of your show. You can even add type "live" on the screen during your presentations. Up to 17 hi-res or 136 lo-res/text pages may be stored per disk. One or two drives are supported. The order and timing of your graphics and text images may be easily (and instantly!) arranged and rearranged. Frame-Up includes a **display module which may be copied** and distributed to your associates so they can run your display, as you designed it, on their Apple or ANY Apple!

Frame-Up is ideal for store displays, presentations to the boss, club programs, trade show booths, product demos, promotions, seminars, conventions, classes, and so on.

$29.50 Machine language. Unprotected. 48K minimum. Peek/Poke Chart included.

BEAGLE BROS DISKS ARE UNLOCKED AND UNPROTECTED. THIS MEANS EVERY PROGRAM IS INSPECTABLE, CUSTOMIZABLE, IF YOU WANT, AND COPYABLE, GIVING YOU THE MOST FOR YOUR SOFTWARE DOLLARS. DON'T SETTLE FOR LESS.



Beagle Bros™ MICRO SOFTWARE

4315 Sierra Vista, San Diego, Ca 92103
714-296-6400

"APPLE" is a registered trade mark of You-Know-Who.

Apple® Mechanic

Shape Writer/Byte-Zap Utility by Bert Kersey

Another best-selling multiple-utility disk—Nine useful, listable, copyable and customizable programs—

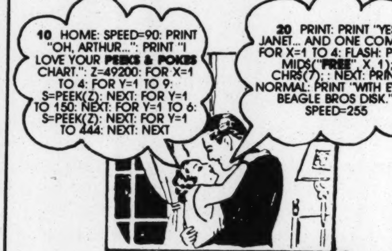
SHAPE EDITOR: Put professional hi-res animation in your programs. Keyboard-draw any shape and let your Apple write a shape table and store it on disk. Design large and small **custom typefaces** too, with special characters. 6 fonts on the disk. LISTable demos show how to use shape tables to animate games, graphic displays, and attractive Charts & Graphs. A valuable time-saving utility/learning tool.

BYTE ZAP: A MUST utility. Rewrite any byte on a disk by loading a sector onto the screen for inspection. **Hex/Dec/Ascii** display optional. Examine bytes via cursor control; enter hex, dec or ascii to change. Create illegal filenames, restore deleted files, change greeting program names, repair/protect disks, change DOS, examine program files. Clear illustrated instructions show how disk data is stored and how to access it. Very educational.

MORE: A disk PACKED with useful music, text and hi-res tricks **for use in your programs.** A great demo-writer program, useful hi-res utilities and educational, entertaining documentation.

$29.50

☐ Unprotected disk (48K min.)
☐ Beagle Bros Tip Book #5
☐ Peeks & Pokes Chart



```
10 HOME: SPEED=90: PRINT
"OH, ARTHUR...": PRINT "I
LOVE YOUR PEEKS & POKES
CHART.": Z=49200: FOR X=1
TO 4: FOR Y=1 TO 9:
S=PEEK(Z): NEXT: FOR Y=1
TO 150: NEXT: FOR Y=1 TO 6:
S=PEEK(Z): NEXT: FOR Y=1
TO 444: NEXT: NEXT
```

```
20 PRINT: PRINT "YES,
JANET... AND ONE COMES":
FOR X=1 TO 4: FLASH: PRINT
MID$("FREE", X, 1);
CHR$(7); : NEXT: PRINT:
NORMAL: PRINT "WITH EVERY
BEAGLE BROS DISK.":
SPEED=255
```

NEW!

Typefaces

for Apple Mechanic

Here are more hi-res fonts for Apple Mechanic's Xtyper and Hi-Writer programs—26 of them at last count, both large and small, all **proportionally-spaced** and positionable anywhere on either hi-res screen. Most are **full 96-character fonts** many with special graphic characters. Each character (from "!" to "□") of every font (from "Ace" to "Zooloo") is, of course, editable with Apple Mechanic's Font Editor.

BONUS: Here's BEAGLE-MENU! A unique greeting program that displays **only the catalog file names you want** on the screen (for example, only locked-Applesoft files, or only Binary files) for one-key cursor selection. Just hit Return to Run, Brun or Exec the program at the cursor. Many other features— Space-on-Disk, Load/Bload option, forward and backward catalog "scrolling" for easy file location, and optional sector-number elimination. PLUS the ability to **swap file names** in your catalog!

$20.00 Unprotected. Beagle Bros' Apple Mechanic disk is required to utilize the type fonts. Beagle-Menu works with all normal-DOS 3.3 disks.

If you don't find our products at your Apple Dealer, tell him to phone Beagle Bros, 714-296-6400, **OR** his favorite software distributor.

NEW!

Flex Text

70-Column Text Utility
by Mark Simonsen

Flex Text is a unique utility that lets you print variable-width text on Apple's hi-res screens in normal 40-column format, 20-column expanded or 56- and **70-column condensed** characters. Character widths may be mixed as you like for emphasis. Flex Text understands **normal Applesoft** Basic commands, including Home, Inverse, Normal, Vtab 1-24 and **Htab 1 through 70**! It also supports text window pokes and scrolling, so you can program normally, but with the **ability to add text to graphics**, or graphics to text! You can even run your existing programs using these features!

Flex Text is easy to use; just boot it and go! You can now display **upper and lower case** characters in any width without hardware. Every keyboard character may be redefined as any symbol you like with a custom text **character editor.** You may toggle between the "normal" text screen and both hi-res pages if you like. Flex Text is **completely compatible** with Neil Konzen's Program Line Editor and G.P.L.E.

$29^50 Machine language. Unprotected. 48K min. Peek/Poke chart included. Condensed character display requires a monitor (instead of a tv) for best results.

CHECK OUT OUR NEW **BEAGLE-MENU** UTILITY, APPEARING ON BOTH THE "TYPEFACES" AND "BEAGLE BAG" DISKS.

```
10  REM HI-RES NUMBER GENERATOR
20  SIZE=5: SCALE=SIZE: REM NUMBER-HEIGHT
30  HGR: HOME: POKE 232, 0: POKE 233, 3: ROT=0
40  FOR A=768 TO 830: READ B: POKE A, B: NEXT A
50  N=N+1: N$=STR$(N): X=99: Y=0
60  FOR A=1 TO LEN(N$): HCOLOR=0: DRAW 8 AT
    X, Y: HCOLOR=3: DRAW VAL(MID$(N$, A, 1))
    AT X, Y: X=X+SIZE+SIZE: NEXT A: GOTO 50
70  DATA 20, 0, 24, 0, 27, 0, 31, 0, 35, 0, 39, 0, 44, 0,
    49, 0, 52, 0, 57, 0, 53, 62, 36, 0, 49, 38, 0, 53,
    55, 61, 0, 53, 23, 37, 0
80  DATA 46, 38, 52, 0, 61, 46, 62, 5, 0, 61, 54, 37, 7,
    0, 53, 38, 0, 54, 37, 60, 46, 0, 53, 39, 53, 62, 5, 0
```

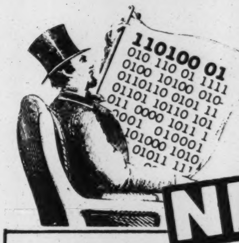
DOS Boss

Disk Command Editor
by Bert Kersey & Jack Cassidy

A classic Apple utility you will ENJOY! Rename DOS commands ("Catalog" can be "Cat", etc.). PROTECT PROGRAMS; any unauthorized save- attempt produces a "Not Copyable" message. Also **List-prevention** and 1-key program-run from catalog. Custom catalogs: Change Disk Volume message to your title; Omit or alter file codes. Rewrite error messages: "Syntax Error" can be renamed "Oops!!" or anything you want! **Two books included**— Fascinating documentation and hours of good Apple reading!

Dos Boss's change features may be appended to your programs so that anyone using your disks (booted or not) formats DOS as YOU designed it.

$24^00
- ☐ Unprotected disk (32K/48K)
- ☐ The Dos Boss Book
- ☐ Beagle Bros Apple Tip Book #2
- ☐ Peeks & Pokes Chart



NEW!

Before you buy any Apple game disk, compare features:

Is there more than one game? Beagle Bag features TWELVE unique games on one disk PLUS a bonus greeting-program utility for use on all of your existing 3.3 disks.

Can it teach programming skills? Beagle Bag games are listable so you can see what makes them work. You can even CHANGE each game's features if you want.

Is the disk copyable? Beagle Bag can be backed-up with ANY copy program. Don't buy software that can't be backed up!

Is the disk unlocked? The Beagle Bag disk can be catalogged, loaded-from, saved-to and Fidded, making it more flexible and more FUN than any locked-up One-Game disk on the market today.

Is the disk priced right? Counting the bonuses, Beagle Bag costs less than $2 per program. This is a disk that will "earn its keep" as long as you own your Apple!

BEAGLE BAG $29^50
(See description on previous page.)

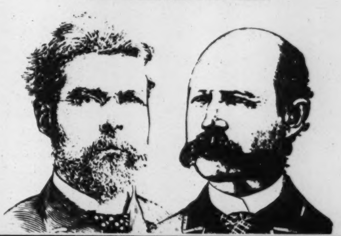
Tip Disk#1

100 Tip Book Tips on Disk
by Bert Kersey

100 programs from Beagle Bros' Tip Books 1, 2, 3 and 4— Fascinating tricks to make your Apple do things it's never done before! All 100 programs are listable, copyable and changeable; and each teaches another fascinating Apple programming technique. **Two different charts are included.**

$20^00
- ☐ Unprotected (32K/48K)
- ☐ Peeks & Pokes Chart
- ☐ Apple II Command Chart

BEAGLE BROS DISKS ARE UNLOCKED AND UNPROTECTED. THIS MEANS EVERY PROGRAM IS INSPECTABLE, CUSTOMIZABLE, IF YOU WANT, AND COPYABLE, GIVING YOU THE MOST FOR YOUR SOFTWARE DOLLARS. DON'T SETTLE FOR LESS.



Beagle Bros™
MICRO SOFTWARE

4315 Sierra Vista, San Diego, Ca 92103
714-296-6400

"APPLE" is a registered trade mark of You-Know-Who.

CIRCLE 124 ON READER SERVICE CARD

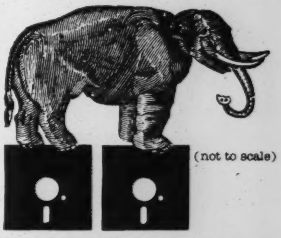
Utility City

21 Utilities on One Disk
by Bert Kersey

A best-seller since it hit the market, and a MUST for your program-development library. Take a look at the features— **List Formatter** makes properly-spaced & indented listings with page breaks; each statement on new line, if-thens and loops called out; a great de-bugger! **Multi-Column Catalog** in any page-width to any printer or CRT. Auto-post Run-Number and last-used Date in programs. Put INVISIBLE working commands in your listings. Access program lines in memory for repair & illegal alteration. Alphabetize & store info on disk. Run any program while another stays intact. Renumber to 65535. Save inverse, trick and **invisible file names**. Convert dec to hex & binary, or Integer to FP. Append programs. Dump text screen to printer...

21 LISTABLE UTILITIES TOTAL!

$29^50
- ☐ Unprotected disk (48K min.)
- ☐ Beagle Bros Apple Tip Book #3
- ☐ Peeks & Pokes Chart


(not to scale)

GOTO Your Apple Dealer.

Most dealers carry our software. If yours doesn't, he can have our disks in his store for you **within 2-3 days** by calling us or his favorite software distributor.

Or Order by Phone:

24-Hour **Toll-Free** Order Desk:
Visa/MasterCard/COD* orders, call
Nationwide: **1-800-854-2003** ext.827
California: **1-800-522-1500** ext.827
Alaska/Hawaii: **1-800-854-2622** ext.827
(ORDERS ONLY, PLEASE) *COD, add $3.00.

OR ORDER BY MAIL—

RUSH! The disk packages checked below plus the free 11x17 Peeks & Pokes Chart:

- ☐ Alpha Plot . $39.50
- ☐ A.Mechanic $29.50
- ☐ Beagle Bag . $29.50
- ☐ DOS Boss . . $24.00
- ☐ Flex Text . . $29.50
- ☐ Frame-Up . $29.50
- ☐ Tip Disk#1 $20.00
- ☐ Typefaces . . $20.00
- ☐ Utility City . $29.50

(Add $1.50 Shipping, any size order. California, add 6% tax.)

NAME$= ______________________

ADDR$= ______________________

CITY$= ______________________

ZIP$= ______________________

VISA

VISA/MASTERCARD Include Card Number & Expiration Date.

master charge THE INTERBANK CARD

Mail U.S.check, money order or Visa/MasterCard numbers to:

BEAGLE BROS, DEPT-C
4315 SIERRA VISTA
SAN DIEGO, CA 92103

All Orders Shipped Immediately.

Please add $4.00 for shipping outside North America. COD orders add $3.00. California residents, add 6%.

If you don't find our products at your Apple Dealer, tell him to phone Beagle Bros, 714-296-6400, **OR** his favorite software distributor.

YOU'LL SOAR
WITH A.E. PRO!

After you experience Data Communications with A.E. PRO™ you'll never settle for being earthbound again!

SOUTHWESTERN DATA SYSTEMS...

- **First** to create terminal software for the Apple II
- **First** to use Macros in a data communications package
- **First** to provide terminal emulation in Apple communications software

Once again, SOUTHWESTERN DATA SYSTEMS creates a software package so far advanced, so innovative, that there are no comparisons.

A.E. PRO (ASCII Express "The Professional"™) truly sets new standards!

Literally thousands of man-hours of work and study have produced the first data communications package that fully utilizes the potential of your Apple Computer System. What does this mean to you?

COMPLETE HARDWARE COMPATIBILITY

Only A.E. PRO takes full advantage of ALL current modem devices available for the Apple II.

Only A.E. PRO supports ALL 80 column boards for the Apple II.

Only A.E. PRO supports ALL printer cards for the Apple II.

This means ALL communications interfaces, ALL printer interfaces, and ALL display interfaces including 80 column cards and external terminals. It couldn't be simpler.

Speeds of up to 9600 Baud are supported, including 110, 300, 1200 and Baudot.

EASY DATA TRANSFER

Data transfer is what communications software is all about. A.E. PRO lets you send and receive with equal ease.

A simple dual key stroke will direct incoming data to its large, up to 28K "capture-buffer", your printer, (with no character loss), or both simultaneously. The buffer can then be written to disk, printed or edited with A.E. PRO's versatile built-in editor.

Data larger than the capacity of the buffer can be saved in buffer-sized "chunks" by use of the auto-save feature, an extension of the popular XON/XOFF protocol used by most main frame computers. As your Apple's memory fills up, A.E. PRO signals the host to pause (XOFF), writes the buffer to disk, and then directs the host to resume sending (XON).

Prices and specifications subject to change without notice.

ERROR FREE TRANSFERS

A wide range of send modes is provided. Everything from the simplest blind block dump, to a packet-oriented error checking mode ensures quick and easy error-free transfer of all sorts of data to practically any host computer. Even the slowest or most awkward systems are easily accommodated.

When two A.E. PRO's are used, you can SEND OR RECEIVE FILES OF ANY TYPE OR SIZE with complete error checking.

POWERFUL MACRO SYSTEM

A.E. PRO supports up to 26 complete macro libraries (remember, S.D.S. pioneered communications macros). Each library contains all macro strings and configuration parameters (baud rate, duplex, parity, etc.) unique to a specific host.

With A.E. PRO's macro facilities you can, with simple keystrokes, direct it to automatically call another computer, connect, and perform complete log-on sequences, virtually instantaneously.

SOPHISTICATED TERMINAL EMULATION

With A.E. PRO, your Apple can "mimic" the display characteristics of many popular terminals, including ADDS, Data General, DEC, Hazeltine, HP, IBM, Lear Siegler, Soroc, Televideo, and many others.

BUILT-IN TEXT EDITOR

A.E. PRO contains a versatile built-in text editor that can easily create or manipulate text. In fact, this editor is more flexible in many respects than some being touted as "word processors". It provides the ease of use of a line oriented editor, with the line editing power of many screen oriented editors, and will process files of up to 35K in size!

RELIABLE UNATTENDED OPERATION

A.E. PRO allows completely unattended answer mode with password protected log-on. In this mode, the caller can remotely send or receive files of ANY type or size.

A.E. PRO can also function as an answerback DDD or TWX node to forwarding mail systems such as Telenet's Telemail, and many others.

A.E. PRO is a member of a family of programs, which include P-TERM "The Professional"™ for Apple Pascal and Z-TERM "The Professional"™ for Apple CP/M™. All three packages share many of these powerful features and operate nearly identically.

For more information write or call us for your free copy of our product catalog and software comparison guide, which include detailed information on all "The Professional"™ series software.

A.E. PRO and other "The Professional"™ series packages are now in stock at local dealers everywhere.

Suggested Retail Price:

ASCII Express	**$129.95**
P-Term	**$129.95**
Z-Term	**$149.95**

SDS southwestern data systems™

10761 Woodside Avenue, Santee, California 92071 (619) 562-3670

CIRCLE 330 ON READER SERVICE CARD

Most of the time, Basic commands should be avoided as they are unnecessary and require knowledge of Basic.

The Boolean Algebra (X:) Instruction

Despite its strange sounding description, this is a rather useful instruction when you know how to use it. This instruction simply checks to see if something is true or false.

A good use for it is in a lesson in which you want to give a student several chances to answer a question before giving him the correct answer. In the lesson below, the student is given two attempts

```
*:START
R:START THE COUNT
B:COUNT = 0
*:VOWELS
T:GIVE ME A VOWEL
A:
M:A,E,I,O,U
JY:NEXT LESSON
B:COUNT = COUNT + 1
X:COUNT < 3
JY:VOWELS
TN:THE VOWELS ARE A, E, I, O AND U
*:NEXT LESSON
...
...
```

"Hello, Dear! I bought a personal computer today. I'm tired of you always quoting your office unit to me."

In this lesson we have combined the Basic (B:) and the Boolean algebra (X:) to cause a count to occur. The X: command near the end, checks to see if the number of answer tries is less than 3. If that statement X:COUNT<3 is true then the next JUMP instruction takes you back to try again. Otherwise the correct answer is given.

Other uses of the B: and X: commands are to count how many answers the student is getting right. You can then decide to branch back and do a review if the percentage gets too low.

Extending The Jump (J:) Instruction

In Tutorial II, the jump instruction was used to jump another named part of the lesson. If you do too much jumping, you can get so many names that you forget what is what (and don't really need to remember once the label is used). In this case you need local labels.

A local label is a name for a part of a lesson that the computer forgets as soon as it meets a real label. This is easier to do than it is to describe.

Suppose we have two lessons, VOWELS and NUMBERS. In each lesson we want to allow the student three attempts to give the correct answer. Using the instructions from before, we could do this

```
*:VOWELS
B:COUNT = 0
*:VOWELS LOOP
T:GIVE ME A VOWEL
A:
M:A,E,I,O,U
JY:NUMBERS
B:COUNT = COUNT + 1
X:COUNT < 3
JY:VOWELS LOOP
T:THE VOWELS ARE A, E, I, O, U
R:
*:NUMBERS
B:COUNT = 0
*:NUMBERS LOOP
T:GIVE ME A NUMBER BETWEEN 1 AND 5
A:
M:1,2,3,4,5
JY:NEXT LESSON
B:COUNT = COUNT + 1
X:COUNT < 3
JY:NUMBERS LOOP
T:YOU COULD HAVE GIVEN ME  1, 2, 3, 4 OR 5
*:NEXT LESSON
```

In this lesson, the lesson start instruction (:) was used five times. This causes two problems. First, this version of Pilot can only remember 40 names of lesson parts with a few jumps, you could run out of memory. Second, each use of the *: command slows the Pilot-to-Basic program down, as it has to search to make sure that you don't use a lesson name more than once. This is, of course, unimportant as we all know that courseware developers have plenty of time.

We can improve things by using local labels.

```
*:VOWELS
B:COUNT = 0
1T:GIVE ME A VOWEL
A:
M:A,E,I,O,U
JY:NUMBERS
B:COUNT = COUNT + 1
X:COUNT < 3
JY:1
T:THE VOWELS ARE A, E, I, O, U
R:
*:NUMBERS
B:COUNT = 0
1T:GIVE ME A NUMBER BETWEEN 1 AND 5
A:                            <-
M:1,2,3,4,5
JY:NEXT LESSON
B:COUNT = COUNT + 1
X:COUNT < 3
JY:1
T:YOU COULD HAVE GIVEN ME  1, 2, 3, 4 OR 5
*:NEXT LESSON
```

The difference between this lesson and the previous one is the introduction of the number 1 before two of the type statements where before there was an additional *: command. These numbers mark a Pilot command. This means you can jump to a marked instruction. You can mark instructions with the numbers 1 to 9.

Normal lesson names must be unique, i.e., used only once in a lesson. However, you will notice that two instructions have been marked with the same number (1). This is allowed because marks are local labels. When the computer reaches the instruction *:NUMBERS it forgets about all the marking it has done to this point. This means that the mark 1 nine lines above no longer exists in the memory of the computer. You can therefore use the mark 1 again after the line *:NUMBERS.

Whether you use local labels (marks) or lesson part names is up to you. In a short lesson, where you will not run out of memory, it makes no difference. In a long lesson, by personal preference, I use both. The lesson part names break the lesson up into major parts, while I use the marks for jumping around inside each of those parts.

Graphics Commands

GO: Clears the graphics screen and sets the color to white.

GQ: Quit Graphics mode. On the Apple, in graphics mode only the last four lines of the screen are used for text. This command uses all the screen for text.

GC: Clears the graphic screen. No color change.

GS: Displays a hi-res picture on the screen. For example, GS:WORLD would cause the picture PIC.WORLD to be displayed.

GP: Draws a spot on the screen. The bottom left-hand corner of the screen is 0,0. To make things easier for drawing the top right-hand corner of the screen is called 100,100. This means the screen is 100 units wide and 100 units long. To get a spot in the center of the screen type GP:50,50. The adjustments to get the spot in the correct place are made by the Pilot-to-Basic program.

Color is automatically set to white by the program. Other colors can be set using the Basic command as in

B:HCOLOR = ###

where ### = 0 for black 4 for black
1 for green 5 (TV dependent)
2 for blue 6 (TV dependent)
3 for white 7 for white

The actual colors and shades of white depend on the TV and the point being plotted. These numbers make the correct colors in Applesoft.

GL: Draws a line from the last spot on the screen to this spot. For example to draw two boxes, one inside the other

```
*:DRAW TWO BOXES
GO:
R:BOX 1
GP:5,5
GL:95,5
GL:95,95
GL:5,95
GL:5,5
R:BOX 2
GP:30,30
GL:30,70
GL:70,70
GL:70,30
GL:30,30
GQ:
E:
```

If you want to do some really fancy graphics you should read *Graphics Software for Microcomputers* by Korites, published by Kern. The software is written in Basic and generates surfaces, rotating solids, etc. It might be a good addition to Pilot if the routines were turned into Pilot commands.

The Sound (S:) Command

Like graphics, the sound command is not very well implemented. You need a sound editor to properly test what you have done. The command is very simple

GS:LENGTH,PITCH

where LENGTH is a number showing how long you want the note to be and PITCH the frequency of the sound. The numbers must be between 0 and 255. Experiment is all I can say. In a 1980 *Creative Computing* Apple Cart, Chuck Carpenter described what musical note went with what pitch.

Conclusion

This is the last of the Pilot tutorials. I hope that they have given you some indication of what Pilot can do. I have many years of computing experience. However, for quick lesson development, I am really growing to like Pilot. It removes most of the irritating SYNTAX errors that you get when trying to develop a lesson in a hurry. When I find that Pilot can't do all I want, I combine lessons developed in other ways with Pilot lessons.

There are many versions of Pilot which run under Basic or Pascal on various machines (Apple, Pet, and Atari) on the market. Try them and see what you like. Based on my own experience and preferences this is what I would look for.

1. A text editor that can reformat the text without splitting words onto two lines.
2. The text editor should be able to check the form (SYNTAX) of the Pilot commands as you type them in. Most

Kelly's Computing

New Toll Free Number
800-572-9215

HOLIDAY SPECIAL
$2.00 OFF COUPON

ATARI
A Warner Communications Company

IBM

ATARI

☐ 400 COMPUTER	399.00	Now	**299.00**
☐ 800 COMPUTER	899.00	Now	**660.00**
☐ 810 DISK DRIVE	599.00	Now	**440.00**
☐ 410 CASSETTE RECORDER	99.00	Now	**87.50**
☐ 850 INTERFACE MOD	219.00	Now	**180.00**
☐ PAC MAN (CART)	44.95	Now	**38.50**
☐ CENTIPEDE (CART)	44.95	Now	**38.50**
☐ CAVERNS OF MARS (DISK)	39.95	Now	**33.50**
☐ STAR RAIDERS (CART)	49.95	Now	**33.50**
☐ SPACE INVADERS (CART)	44.95	Now	**27.50**
☐ ASTEROIDS (CART)	44.95	Now	**27.50**
☐ MISSILE COMMAND (CART)	44.95	Now	**27.50**
☐ JOYSTICKS (PAIR) (ACCS)	21.95	Now	**19.50**
☐ PADDLES (PAIR) (ACCS)	21.95	Now	**19.50**
☐ GOLD EDITION 1-12 (DISK & CASS) (WHILE THEY LAST)	100.00	Now	**87.50**
☐ ADVENTURES 1-12 (CASS)	24.95	Now	**19.50**
☐ LUNAR LANDER (CASS)	14.95	Now	**13.50**
☐ STAR FLITE (DISK)	19.95	Now	**16.50**
☐ REAR GUARD (DISK)	19.95	Now	**16.50**
☐ GALACTIC EMPIRE (CASS)	19.95	Now	**16.50**
☐ GALACTIC TRADER (CASS)	19.95	Now	**16.50**
☐ PREPPIE (DISK)	29.95	Now	**25.50**
☐ PREPPIE (CASS)	29.95	Now	**25.50**
☐ TEMPLE OF APSHAI (DISK & CASS)	39.95	Now	**33.50**
☐ STAR WARRIOR (DISK & CASS)	39.95	Now	**33.50**
☐ RESCUE AT RIGEL (DISK & CASS)	29.95	Now	**25.50**
☐ DATESTONE OF RYN (DISK & CASS)	19.95	Now	**16.50**
☐ CRUSH, CRUMBLE & CHOMP (DISK)	29.95	Now	**25.50**
☐ INVASION ORION (DISK & CASS)	24.95	Now	**19.50**
☐ UPPER REACHES OF APSHAI	19.95	Now	**16.50**
☐ CURSE OF RA	19.95	Now	**16.50**
☐ CRYPTS OF TERROR (DISK)	34.95	Now	**29.50**
☐ CRYPTS OF TERROR (CASS)	29.95	Now	**25.50**
☐ TANKTICS (CASS)	24.00	Now	**19.50**
☐ CONTROLLER (DISK)	30.00	Now	**25.50**
☐ EMPIRE OF THE OVERMIND (DISK)	35.00	Now	**29.50**
☐ EMPIRE OF THE OVERMIND (CASS)	29.50	Now	**25.50**
☐ SHAMUS (DISK & CASS)	34.95	Now	**29.50**
☐ MASTER TYPE (CASS)	39.95	Now	**33.50**
☐ BASKETBALL (CART)	34.95	Now	**29.50**
☐ SUPER BREAKOUT (CART)	44.95	Now	**33.50**
☐ SCRAM (CASS)	24.95	Now	**19.50**
☐ TOUCH TYPING (CASS)	24.95	Now	**19.50**
☐ MAILING LIST (CASS)	24.95	Now	**19.50**
☐ MACRO ASSEMBLER & TEXT EDITOR	89.95	Now	**78.50**
☐ ASSEMBLER	59.95	Now	**50.50**
☐ FILE MANAGER 800 (DISK)	99.95	Now	**87.50**
☐ DISK MANAGER (DISK)	29.95	Now	**25.50**
☐ MICRO PAINTER (DISK)	34.95	Now	**29.50**
☐ GRAPHIS MASTER (DISK)	39.95	Now	**33.50**
☐ SAMMY THE SEA SERPENT (DISK & CASS)	24.95	Now	**19.50**
☐ PAGE 6 (DISK)	34.95	Now	**29.50**
☐ DISK DETECTIVE (DISK)	29.95	Now	**25.50**
☐ PATH FINDER (DISK)	34.95	Now	**29.50**
☐ SPEED READ PLUS (DISK)	59.95	Now	**50.50**
☐ SPACE EGGS (DISK)	29.95	Now	**25.50**
☐ GALAXY (DISK)	25.00	Now	**19.50**
☐ B-1 NUCLEAR BOMBER (CASS)	16.00	Now	**13.50**
☐ MIDWAY CAMPAIGN (CASS)	16.00	Now	**13.50**
☐ NORTH ATLANTIC CONVOY RAIDER (CASS)	16.00	Now	**13.50**
☐ NUKEWAR (CASS)	16.00	Now	**13.50**
☐ CONFLICT 2500 (CASS)	16.00	Now	**13.50**
☐ LORDS OF KARMA (CASS)	20.00	Now	**16.50**
☐ APPLE PANIC (DISK)	29.95	Now	**25.50**
☐ RASTER BLASTER (DISK)	29.95	Now	**25.50**
☐ BUG ATTACK (DISK)	29.95	Now	**25.50**
☐ CANYON CLIMBER (DISK & CASS)	29.95	Now	**25.50**
☐ LE STICK (ACCS)	39.95	Now	**33.50**
☐ PACIFIC COAST HIGHWAY (DISK & CASS)	29.95	Now	**25.50**
☐ INTRUDER (DISK)	34.95	Now	**29.50**
☐ INTRUDER (CASS)	29.95	Now	**25.50**
☐ SHOOTING ARCADE (DISK & CASS)	29.95	Now	**25.50**
☐ TRACK ATTACK (DISK)	29.95	Now	**25.50**
☐ CLOWNS & BALLOONS (DISK & CASS)	29.95	Now	**25.50**
☐ MEGALEGS (DISK & CASS) (WHILE THEY LAST)	34.95	Now	**29.50**
☐ COMPU-READ (DISK)	29.95	Now	**25.50**
☐ COMPU-MATH/FRACTIONS (DISK)	39.95	Now	**33.50**
☐ COMPU-MATH/DECIMALS (DISK)	39.95	Now	**33.50**
☐ COMPU-MATH/FRACTIONS (CASS)	29.95	Now	**25.50**
☐ COMPU-MATH/DECIMALS (CASS)	29.95	Now	**25.50**
☐ MATCH RACERS (DISK)	29.95	Now	**25.50**
☐ PATHFINDER (AVAIL. FALL) (DISK)	34.95	Now	**29.50**
☐ DEADLINE (DISK)	49.95	Now	**42.50**
☐ ZORK I (DISK)	39.95	Now	**33.50**
☐ ZORK II (DISK)	39.95	Now	**33.50**
☐ POOL 400 (CART)	39.95	Now	**33.50**
☐ ACTION QUEST (DISK & CASS)	29.95	Now	**25.50**
☐ K-RAZY SHOOTOUT (CART)	49.95	Now	**42.50**
☐ SPEED READ PLUS (DISK)	59.95	Now	**50.50**
☐ HI-RES ADV. #0- MISSION: ASTEROID (DISK)	24.95	Now	**19.50**
☐ HI-RES ADV. #2- WIZ & PRINCESS (DISK)	32.95	Now	**29.50**
☐ CROSSFIRE (DISK)	29.95	Now	**25.50**
☐ JAWBREAKER (DISK & CASS)	29.95	Now	**25.50**
☐ THRESHOLD (DISK)	39.95	Now	**33.50**
☐ THE NEXT STEP (DISK)	39.95	Now	**33.50**
☐ ALI BABA AND THE FORTY THIEVES (DISK)	32.95	Now	**29.50**
☐ DELUXE INVADERS (DISK)	34.95	Now	**29.50**
☐ GALACTIC CHASE (DISK)	29.95	Now	**25.50**
☐ GALACTIC CHASE (CASS)	24.95	Now	**19.50**
☐ THE SHATTERED ALLIANCE (DISK)	39.95	Now	**33.50**
☐ PROTECTOR (DISK & CASS)	34.95	Now	**29.50**
☐ CHICKEN (DISK & CASS)	34.95	Now	**29.50**
☐ DODGE RACER (DISK & CASS)	24.95	Now	**19.50**
☐ WARLOCK'S REVENGE (DISK)	35.00	Now	**29.50**
☐ WORDRACE (DISK)	24.95	Now	**19.50**
☐ ALIEN SWARM (DISK)	34.95	Now	**29.50**
☐ ALIEN SWARM (CASS)	29.95	Now	**25.50**
☐ SNAKE BYTE (DISK)	29.95	Now	**25.50**
☐ CYCLOD (DISK)	29.95	Now	**25.50**
☐ JOYSTICK	29.95	Now	**25.50**
☐ JOYSTICK DELUXE	39.95	Now	**34.50**
☐ FAMOUS RED BALL	34.95	Now	**29.95**
☐ TRACKBALL	69.95	Now	**63.50**

IBM

☐ LOST COLONY (DISK)	29.95	Now	**25.50**
☐ TEMPLE OF APSHAI (DISK)	39.95	Now	**33.50**
☐ GALAXY (DISK)	25.00	Now	**20.50**
☐ MIDWAY CAMPAIGN (DISK)	21.00	Now	**19.50**
☐ COMPUTER STOCKS AND BONDS (DISK)	25.00	Now	**20.50**
☐ VOYAGER (DISK)	25.00	Now	**20.50**
☐ DRAW POKER (DISK)	21.00	Now	**19.50**
☐ CHAMPIONSHIP BLACKJACK (AVAIL JULY) (DISK)	39.95	Now	**33.50**
☐ THE HOME ACCOUNTANT PLUS (DISK)	150.00	Now	**125.00**
☐ WRITE-ON (DISK)	129.95	Now	**110.00**
☐ EASy (EXECUTIVE ACCOUNTING SYSTEM) (DISK)	725.00	Now	**575.00**
☐ DEADLINE (DISK)	49.95	Now	**42.50**
☐ ZORK I (DISK)	39.95	Now	**33.50**
☐ ZORK II (DISK)	39.95	Now	**33.50**
☐ T.I.M. III (DISK) **("Total Information Management")**	495.00	Now	**399.00**
☐ MATHEMAGIC (DISK)	89.95	Now	**75.00**
☐ EASY SPELLER (DISK)	175.00	Now	**149.00**
☐ EASY FILER (DISK)	400.00	Now	**335.00**
☐ EASYWRITER II (DISK)	350.00	Now	**280.00**
☐ THE TAX MANAGER (DISK)	250.00	Now	**199.00**
☐ WORDSTAR (DISK)	495.00	Now	**399.00**
☐ MAILMERGE (DISK)	150.00	Now	**99.00**
☐ CONQUEST (AVAIL JULY) (DISK)	29.95	Now	**25.50**
☐ SUPERCALC (DISK)	295.00	Now	**225.00**
☐ SUPERWRITER (AVAIL JULY) (DISK)	395.00	Now	**299.00**
☐ IBM JOYSTICKS (ACCS)	64.95	Now	**55.00**
☐ GRAPHICS HARDCOPY SYSTEM (DISK)	24.95	Now	**19.50**
☐ VERSAWRITER GRAPHICS TABLET (ACCS)	299.00	Now	**250.00**
☐ DESKTOP PLAN I (DISK)	300.00	Now	**250.00**
☐ VISITREND/PLOT (AVAIL JULY) (DISK)	300.00	Now	**250.00**

RAM FOR ATARI 400 + 800

48K (Reg. $299.00) *NOW* **$149.00**
32K (Reg. $199.00) *NOW* **$75.00**

COUPON

$2.00 OFF ORDER

To redeem, place a mail order for $50.00 or more and include this coupon. OFFER EXPIRES JANUARY 1, 1983.

★ TO ORDER CALL TOLL FREE 1-800-572-9215. CALIFORNIA RESIDENTS CALL 714-369-8113 OR WRITE TO 3515 BRYCE WAY, RIVERSIDE, CA 92506. ★

WE PAY SHIPPING on software orders OVER $75 in the Continental U.S. (Foreign & Air Extra). ADD $2.50 SHIPPING & HANDLING on orders under $75. **CALIF. RESIDENTS ADD 6% SALES TAX.** We accept **MASTER CARD** and **VISA. C.O.D.'S ADD $5.00.**

NAME ____________________
STREET ____________________
CITY ____________ STATE & ZIP ____________
CARD # ____________ EXP. DATE ____________
SIGNATURE ____________________
CHECK HERE FOR FREE CATALOG ____________

CIRCLE 212 ON READER SERVICE CARD

PERSONAL COMPUTERS PERSONAL COMPUTERS PERSONAL COMPUTERS

Altos 5-15D	$2295.00
Amdek Video 300	139.00
Amdek Color I 13″ Monitor	315.00
Atari 800 Computer w/16K	645.00
Atari 810 Disk Drive	439.00
C-Itoh Prowriter 8510AP (parallel)	459.00
Comrex CR-5500 12″ Green Monitor	119.00
Comrex Com-Riter w/Serial Interface	879.00
Daisywriter 2000 Letter-Quality Printer	1049.00
Diablo 630 RO Daisywheel Printer	1999.00
DEC Rainbow 100 Personal Computer	2995.00
Epson HX-20 Portable Personal Computer	659.00
Epson MX-80FT Type III w/Graftrax Plus	499.00
Epson MX-100FT Type III w/Graftrax Plus	699.00
Hayes Smartmodem	225.00
IDS Microprism	599.00
IDS Prism 132 (w/all options & color)	1559.00
Microsoft Premium System for Apple II	579.00
NEC 3510 Letter Quality Printer w/RS232	1529.00
NEC 7710 RO Spinwriter	2195.00
Lear Sigeler ADM3A Dumb Terminal	569.00
NEC PC8023 Dot-Matrix printer	489.00
NEC JB1201M(A) 12″ Green Monitor	169.00
Okidata Microline 82A	419.00
Okidata Microline 83A	695.00
Okidata Microline 84P	979.00
Okidata Microline 84S	1079.00
Rana Elite I Disk w/Controller	465.00
Smith Corona TP-1 Letter Quality printer	639.00
Televideo 950 Terminal	995.00
USI Pi-3 12″ Amber Monitor	175.00
Videx Videoterm	259.00
Xedex Baby Blu CPM Card for IBM	499.00

OMEGA DELIVERS FOR LESS

OKIDATA MICROLINE 82A

or

EPSON MX-80FT

YOUR CHOICE $499.00

SOFTWARE

Omega carries software by the following companies:
- American Business Systems • Ashton Tate • Dakin 5
- Innovative Software • Micropro • Microsoft
- Sorcim • Stoneware • Visicorp

MAGNETIC MEDIA

Omega carries diskettes by listed companies:
- Dysan • Maxell • Scotch • Verbatim

ACCESSORIES

Omega carries accessories for the Apple II by the following manufacturers:
- D.C. Hyes • Microsoft • Tymac • M & R Enterprises
- Mountain Computer • Kensington Microware • Practical Peripherals • T. G. Products • Videx

CALL TOLL FREE!

800-343-0873

PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE

We carry the complete line of Atari Hardware, Software & Peripherals.

We will try to match or beat any price with similar purchase conditions.

OMEGA SALES COMPANY

430 PEARL STREET, STOUGHTON, MA 02072
(617) 344-6645 TOLL FREE (800) 343-0873

CIRCLE 287 ON READER SERVICE CARD

Pilot Tutorial II, continued...

errors are simple, and if caught while you are in the editing mode, are very simple to correct.

3. A graphics editor. This should allow a mixture of both text and graphics. Most important is the ability to remove things you don't like. Look for an editor that allows you to remove things half way between the start and end of your program. You should be able to see what you have drawn while you are in the editor.

4. A sound editor. This should allow you to adjust pitch, length and quality of the note. You should have the ability to hear the notes you have made while you are in the editor.

5. Computational speed. For scientific courseware, you might want to generate a thousand random numbers to simulate an experiment. This should not take forever.

6. The ability to type on a printer during a lesson so that a student can keep a copy of something.

The Pilot-to-Basic translator will do this. Try the following

```
B:PRINT CHR$(4);"PR#1"

R: enter what you want to be typed

...

...

B:PRINT CHR$(4);"PR#0"
```

...Powerful instruction, that B: instruction.

7. The ability to call other programs written in Basic or Pilot. This way you can combine good courseware from several sources.

8. The ability to add to the instruction set if you want to. This is very useful if you find you have specialized things you want to do frequently. This basically means good documentation for the person using the courseware and for the hacker...I mean, program modifier. ☐

unicomm T.M. INC.
THE PURCHASING SERVICE FOR HOME & BUSINESS COMPUTERS
18639½ VENTURA BLVD., TARZANA, CA 91356 (213) 996-5722

your ATARI® connection

ATARI 800	659.00
NEC 823A	479.00
OKIDATA 82A	459.00
NEC color monitor	329.00
HAYES Smartmodem	219.00
HAYES Micromodem II	269.00
VERBATIM diskettes	26.00

add 3% shipping/handling/insurance
30 day guarantee
FREE catalog and newsletter

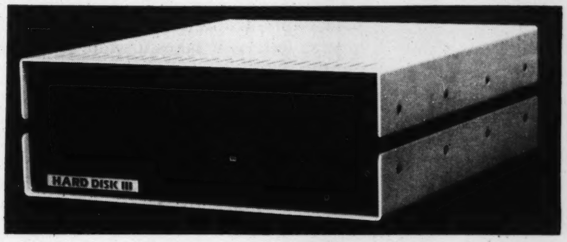
CIRCLE 357 ON READER SERVICE CARD

WHAT'S ECC?

ECC (Error Correction Code) is a polynomial derivative which is used to detect and correct errors. In simpler terms, this means that the computer will detect and automatically correct data errors sometimes generated spuriously in the equipment.

VR Data's HARD DISK III has this feature. If your system will abend or die during a data error or if you must always have the correct data for your functions, ECC is a necessity. This feature has filtered down from the larger computer systems and is now used by manufacturers of superior micro computer products.

Imagine a 5 meg Winchester Hard Disk with the following features:



ALL FOR $1899. Complete

- ECC—onboard buffer
- FCC approval—Heavy Duty Power Supply
- Automatic power on with system
- Heavy duty linear power supply
- Gold plated contact on all connectors
- Heavy gauge aluminum chassis
- 115/230 VAC 60/50 HZ Standard
- State-of-the-art controller
- 2 pass forced air cooling system

ONLY FROM VR data
777 Henderson Boulevard N-6 Folcroft, PA 19032
(215) 461-5300 (800) 345-8102

Interfaces to: Radio Shack TRS 80 Model I • Radio Shack TRS 80 Model III • IBM Personal Computer • Others to be announced

CIRCLE 363 ON READER SERVICE CARD

Improving Readability

Rich Lundeen

> *Screen interaction is a new art form. Different strokes for different blokes.*

The difference between a professionally designed program and an amateur creation is generally quite obvious to anyone who uses it. Many factors contribute to the differences, but one subtle factor often overlooked by new programmers is the readability of the screen displays and instructions.

You can improve the readability of your programs by remembering to use a few basic principles in the design of your screen displays.

Open Space

First: Always leave plenty of open space. The layout of a screen display is like the layout of a page in a book. It looks much better with margins and blank space around and between paragraphs or elements of the display. Imagine what this article would look like if the first line started at the top of the page and filled every line to the very edge.

When a screen is filled from top to bottom and left to right, it looks very busy and is very difficult to read. A full display implies that nothing on the screen is very important, not to mention the fact that on some screens the edges are so distorted that they can't be read.

On a single display page break the narration into several paragraphs and confine each paragraph to three or four lines of text. Block the edges of each line so that left and right margins are equal. Limiting the number of characters per line will produce a more readable display, but it also forces you to streamline your words and be more concise, and that helps the user to understand your instructions.

Use indentation of paragraphs to call attention to specific important points. This is particularly useful for:

lists
menus
numbers
codes
cautions
commands

The use of open space, blocking and indentation will require more screens to be displayed, but from the user point of view it is faster to call up another screen than it is to re-read the same screen many times.

> ***Highlighting is effective, because it ensures that important things are seen even when the user is in a hurry.***

Highlighting

Second: Highlight important items. Many user problems can be traced back to a lack of attention to some important step or procedure. Call attention to important items by using the computer's built in highlighting techniques, inverse and flashing. Display key words and paragraphs as inverse characters or use flashing to signal a special precaution.

But be careful: an entire word or paragraph of flashing characters can be very difficult to read. Use flashing on caution words, but use inverse or normal for the explanation. Also remember that inverse numbers and words are easier to read if the spaces before and after are also inverted.

Another way to highlight is to use special characters to separate key words or phrases from other items on the screen.

You can use any of the special symbols to draw lines or boxes around important text.

Other more subtle techniques include the use of CAPITALIZATION, (parentheses) or special symbols before and after ** key words **.

In the previous sentence there are so many things highlighted, and so many different techniques used, that the important items get lost in the jumble. If the user must reread the sentence, then too many good things can be bad. Highlighting is effective *if it's not overdone*, because it ensures that important things are seen even when the user is in a hurry,

Consistency

Third: Be consistent wherever possible. As creatures of habit, people tend to become accustomed to things, and when those things change they become temporarily confused. If users encounter a new format every time they go to a new screen, it will take them a bit longer to read each screen because they must re-adjust their expectations. For instance: if you have been reading screens where the key words are highlighted with capitalization, and suddenly find inverse letters, it takes a while to figure out the significance of the change.

The same concern for consistency should be shown in the layout of the screen and the formatting of paragraphs from screen to screen. Titles are a good way to let users know where they are in the program, but don't change the location and style of the title display each time it is used. Once you have established the location or format for menus, paragraph indentation, input statements or any repeated item, maintain that style and location throughout the program.

The same consistency should be applied to lists, codes and user entries. Text should be left-justified and columns of numbers should be right-justified. Don't ask for

---

Richard Lundeen, 400 Menominee Lane, Naperville, IL 60540.

numeric codes one time and alphabetic codes later. Nor should the meaning of codes in different parts of the program be changed.

To minimize user confusion and the errors that can result from misunderstandings, the wording and syntax of instructions must be consistent. The best sequence is always to state the reason first and then the action required. These are examples of that format.

To select option press ...
or
Set parameter by entering...
or
To change value you must...

Another way to give instructions is to use examples in place of narration. Sometimes an example communicates better than words. For instance: Which of the following input requests is most likely to result in correct input from the user?

Enter date.
or
Enter date (month and year)
or
Enter date (eg: APR/80)

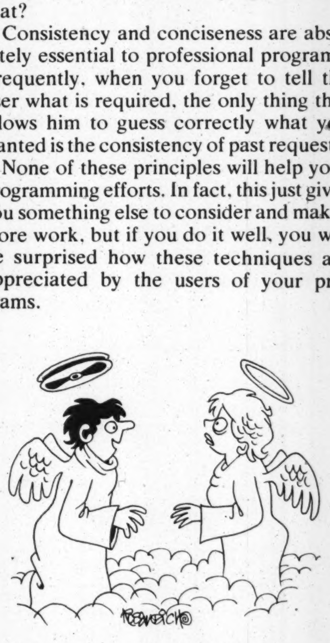
How about this pair of requests?

Enter name (last name comma then first name and middle initial and period)
or
Enter name (eg: Doe, John A.)

Remember to use the same terminology throughout your program. Have you ever had trouble deciding if the programmer meant the same thing when you see the words "data base" in one display and then "file" in the next one and "program" after that?

Consistency and conciseness are absolutely essential to professional programs. Frequently, when you forget to tell the user what is required, the only thing that allows him to guess correctly what you wanted is the consistency of past requests.

None of these principles will help your programming efforts. In fact, this just gives you something else to consider and makes more work, but if you do it well, you will be surprised how these techniques are appreciated by the users of your programs. ☐



"How can you tell I was a computer programmer?"

TRS-80
Includes a FREE Green Screen, a $22.95 Value!

ATARI
Home Computer

MODEL III 16K $789
MODEL III 48K $1898
MODEL 400 16K $289
MODEL 800 16K $649

Price — We have the best price. Check the others, but call us.
Selection — ATARI • APPLE • TRS-80 • EPSON • OKIDATA • C. ITOH, etc.
Service — Most items in stock for immediate shipment. Call or write for Free 40 page catalog of over 600 items.

Computer Discount of America
15 Marshall Hill Road
West Milford Mall
West Milford, NJ
07480-2198
In New Jersey call
201-728-8080

CALL TOLL FREE: 800-526-5313

CIRCLE 146 ON READER SERVICE CARD

GAME DESIGNER

HAVE YOU HEARD ABOUT THE *FROB*™

The Atari® VCS Game Development System

It allows just about anyone the opportunity to design home video game cartridges for the Atari VCS game console.

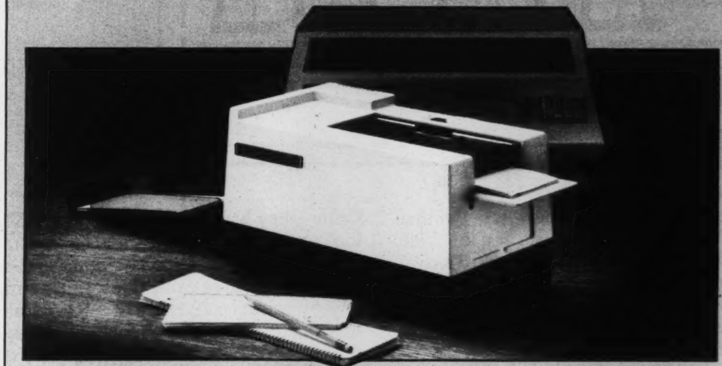
Don't miss the boat.

Call 408-429-5138

or write: FROBCO, P.O. Box 2780
Santa Cruz, CA 95063

CIRCLE 263 ON READER SERVICE CARD

Data Entry Problems?



Our New 2000 Series Solves Them...5 Ways!

1. EASE OF DATA ENTRY
Enter data into your personal computer by simply marking standard cards with a pencil. No special training needed. The 2000 Series even reads pre-printed data and punched holes.

2. USER FRIENDLY DESIGN
The 2000 comes with 2 different interfaces: an intelligent interface for the Apple and an RS-232C. Both models simplify user software by converting card data easily to one of 4 different modes, or any combination of them: ASCII, Card Image, Quick Program and Self Programming. Makes your programming tasks quick and easy.

3. AUTOMATIC FEED
The 2000 Series reads up to 60 cards per minute, automatically! Just load the feeder tray and the 2000 does the rest. Cards can vary in length from 5 to 12 inches, and each one can contain up to 128 columns of data.

4. LOW COST
The cost, including a choice of interfaces, is only $1595. Compare that to keypunch or computer terminals, plus the expense of operating them.

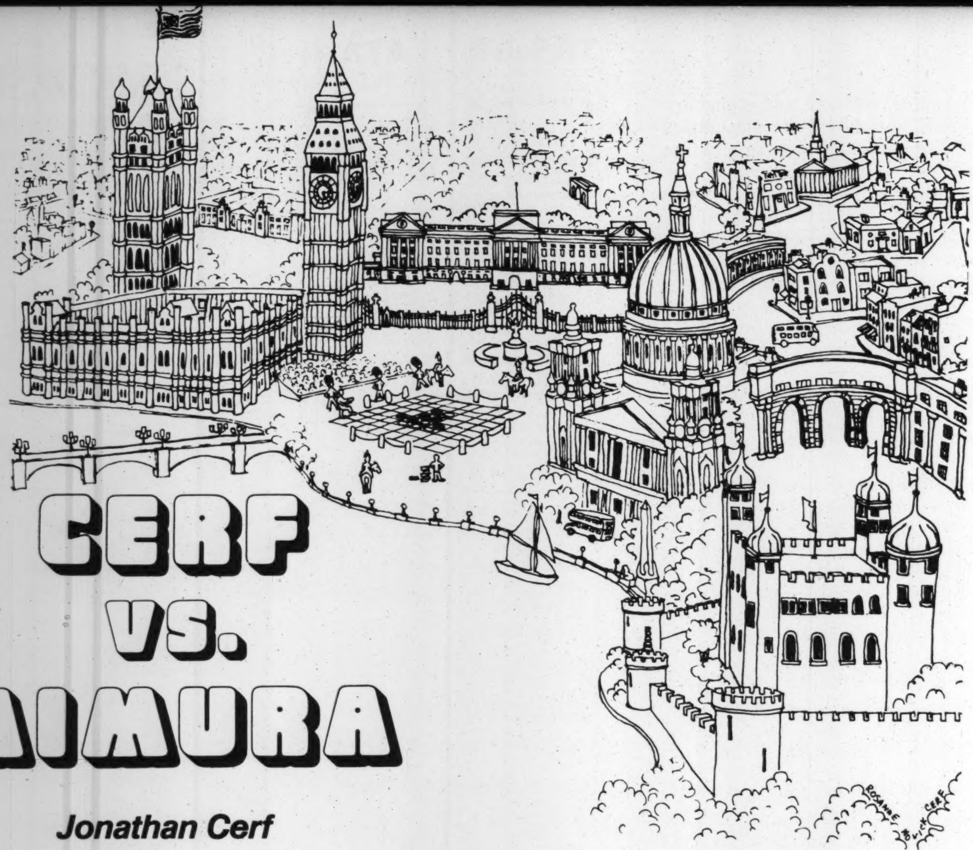
5. RELIABLE OPTICAL SENSOR
State-of-the-art fibre optics "read" each card reliably and accurately, with a single, long-lasting bulb providing the light source.

So, to quickly solve your data entry problems, put in your order now for a new 2000 Series. It's ideal for education, medical, business, and a host of other computer applications.

And remember... whatever your needs, Chatsworth Data still offers the industry's largest selection of card readers. Write or phone for complete details...today!

CHATSWORTH DATA CORPORATION
20710 Lassen Street Chatsworth, California 91311 Phone: (213) 341-9200

CIRCLE 135 ON READER SERVICE CARD



CERF VS. MIMURA

Jonathan Cerf

The game analyzed below was the first of a best of three game set for the 1980 world championship. I was Black. Takuya Mimura, the Japanese champion, was White. (See Diagram 1 for a full game transcription). Like everyone else, I had expected Mimura to win this game. In the four year history of the international competition no Japanese champion had ever lost a game, and my own record against the Japanese was not confidence-inspiring—no wins, six defeats. But I was determined to make things as difficult and unpleasant for Mimura as I possibly could.

Moves 1-10

Mimura (White) chose the perpendicular opening, and the first five moves were very conventional. My moves 3 and 5 were borrowed from Black games of Inoue and Maruoka. At move 6 Mimura departed from published White lines of Inoue and Ohta—they had played 6-c6. Although f3 looks playable at move 7 (Diagram 2), I opted instead for 7-e6. The point of 7-e6 is that it captures central discs at e4 and e5—experience suggests that it is generally unsound to allow your opponent exclusive ownership of the center while your own discs are scattered about the periphery. (7-f3 would not have immediately dealt with the center problem, but would have laid the groundwork for a later correction with a Black move to either c4, c6 or e6.)

Through move 10 the game was identical to a game I had lost to Mimura in the preliminary round. Remarkably, it was also identical to a game I had played against Carol Jacobs a week earlier in the U.S. Nationals. (Carol seems to have a special knack for independently inventing openings preferred by Japanese champions.)

Moves 11-20

During the lunch break following the Preliminaries I replayed my morning loss to Mimura, and I decided that if the opportunity arose I would try something different at move 11. The move I had played against Carol, 11-c4, had been somewhat more successful than my 11-d2 against Mimura, but I now rejected both

	a	b	c	d	e	f	g	h
1	●53	○30	●29	●27	○28	○22	●51	○50
2	○40	○46	○16	●15	○18	●17	●45	●39
3	●41	●23	○14	○6	●5	○10	●19	○24
4	●33	○32	●13	○	●	○4	●11	●25
5	○34	●37	●3	●	○	●1	○8	○44
6	●35	○36	●9	○2	●7	○12	●43	●21
7	○42	●56	●31	○26	○20	●47	○52	○54
8	●55	○58	●57	○38	●49	○48	●59	○60

Diagram 1. Cerf (B-44) vs. Mimura(W-20).

	a	b	c	d	e	f	g	h
1								
2								
3				○	●			
4				○	○	○		
5			●	○	○	●		
6				○				
7								
8								

Diagram 2. Black to play. Cerf chose e6.

This article is reprinted from *Othello Quarterly*, the official journal of the United States Othello Association. For information about membership in the USOA (and for a free copy of the *Quarterly*), write: USOA, P.O. Box 342, Falls Church, VA 22046.

CALL "THE COMPUTER-LINE"™

We wish all our customers a very happy Christmas and a prosperous New Year.

When you call us, you talk to fully qualified computer specialists trained to answer all your questions pertaining to our line of microcomputers. We are renowned for our excellent after sales support and our promptness for delivery. Peace of mind and excellence in service is our pledge to all our customers.

IBM PERSONAL COMPUTER PRODUCTS

QUADRAM CORPORATION

QUADBOARD

The ultimate memory board for the IBM, featuring:

- fully expandable from 64 to 256K
- parallel port
- asynchronous (RS232) serial port
- clock/calendar

$CALL

MICROFAZER

- buffering from 8 to 64K (4 to 32 pages of text)
- printer and computer independent
- parallel/parallel; serial/serial and parallel/serial available
- compute while you print!

INTERFAZER

Used as:

- Peripheral buffer
- Multi-User Printer Controller
- Computer I/O Expander
- Incompatible Device Interface
- Peripheral Multiplexer
- Data Transfer Rate Converter

$CALL

Davong Systems, Inc.

Description:

The Davong Systems Memory Card is a convenient RAM memory expansion card for use in the IBM Personal Computer.

The Memory Card may be placed in any free system slot. It is completely compatible with all IBM Personal Computer software and hardware, and runs at the same speed as IBM memory products.

_____64K RAM $225 _____192K RAM $499

______256K RAM $599

Hard Disk System for the IBM® Personal Computer.

ONLY $1595.00

Description:

The Davong System's Hard Disk Drive fits conveniently inside the second floppy drive location of the IBM Personal Computer chassis, providing more than 30 times the capacity of a floppy diskette, plus greater speed and reliability.

The DSI-501 System is compatible with IBM software, and supports IBM DOS*. The system includes all necessary components and software for installation.

12 MEGABYTES STORAGE	$2195.00

TANDON ADD-ON DRIVES FOR IBM

SPECIAL

TMS-100-2, Doublé sided drive, 320 K bytes storage	$274
Including shipping anywhere within the continental U.S.A.	—

IBM SOFTWARE

BUSINESS

WORDSTAR	$289
MAILMERGE	$ 79
TAX MANAGER	$199
256K VISICALC	$189
VISITREND/VISIPLOT	$239
VISIDEX	$189
EASY EFFECTIVE ACCOUNTING SYSTEM	$389
SUPERCALC	$219
SUPERWRITER	$289

ENTERTAINMENT

GALACTIC ATTACK	$26
ZORK I	$29
ZORK II	$29
DEADLINE	$39
"CALL FOR NEW GAMES AT UNBEATABLE PRICES"	
T and G JOYSTICKS	$44.95
ADAM AND EVE PADDLES	$29.95

CALL FOR SOFTWARE NOT LISTED

MAYNARD ELECTRONICS

Floppy Disk Controller/with parallel	$229
Floppy Disk Controller/with serial	$259

PERIPHERALS FOR ALL COMPUTERS

PRINTERS

NEC

Spinwriter 7710/7730	$2339
8023A	$ 489

EPSON (Graftrax Plus)

MX-80	$ 429
MX-80FT	$ 529
MX-100	$ 699

OKIDATA

80 no tractor	$ 339
80 with tractor	$ 399
82A no tractor	$ 439
82A with tractor	$ 479
83A	$ 689
84A parallel	$1029
84A serial	$1139
2K Buffer	$ 55
Graphics 82A, 83A	$ 79

All Epson, NEC, C-ITOH and OKIDATA dot matrix printer prices quoted are for **immediate** delivery inclusive of shipping, insurance and handling charges.

MONITORS

Zenith ZVM-121 Phosphor, 15 MHZ	$ 119
NEC 1201 Phosphor, 20 MHZ	$ 179
NEC 0112 Composite, Color	$ 335
NEC 2112 RGB Color	$ 899
Amdek 300 Phosphor	$ 179
Amdek Composite Color	$ 349
Amdek IBM Compatible Color	$ 749
BMC Green	$ 89
BMC Composite Color	$ 279

(All BMC monitors have 12 month replacement warranties)

INTEGRAL DATA SYSTEMS

PRISM 132 Color printer with all options

- 200 cps Sprint Mode
- 4-color printing
- Friction/Tractor feed $1595

C-ITOH

F10 Word Quality Printer

- 40 CPS Printing
- Letter quality excellence

Now Only $1395

Prowriter 120cps (Parallel)	$ 469
Prowriter 120cps (Parallel Serial)	$ 619
Prowriter (136 column) Parallel	$ 699
Prowriter (136 column) Parallel Serial	$ 749
Brother HR1 Letterquality	$ 899

MODEMS

Hayes Smartmodem 300 baud	$ 229
Hayes Smartmodem 1200 baud	$ 549
Novation Cat	$ 145
Novation D-Cat	$ 165
Novation Auto Cat	$ 209
CERMETEK	$CALL

1200 baud modem

DISKETTES

SCOTCH WITH PLASTIC LIBRARY CASES (Boxes of 10) (48 Track single-sided double density)	$26.50
VERBATIM DATALIFE SS/DD (Boxes of 10)	$24.95

APPLE PRODUCTS

CALIFORNIA COMPUTER SYSTEMS

7710 Async. Serial Int.	$135
7490 GPIB (IEEE-488)Int.	$239
7470 Ana. to Dig. Converter	$ 99
7711 Async. Serial (Term)	$135
7712 Sync. Serial Int.	$149
7721 Apple Parallel Int.	$109
Calendar/Clock Module	$ 99
Programable Timer	$ 99

MOUNTAIN HARDWARE

CPS Multi-Function Card	$169
The Clock	$229
Supertalker	$159
Music System	$319
Expansion Chassis	$599
Romwriter	$139
Ram Plus	$149

MICROCOMPUTER BUSINESS INDUSTRIES

Appletime™ Clock Card	$ 89
VIP™ I Card. (The Ultimate graphics interface + cable)	$ 99
All other VIP™ Cards	$CALL

BUSINESS SOFTWARE

VISICORP, INC.

Desktop Plan III	$229
Desktop Plan II	$189
Visifiles	$189
Visiplot	$159
Visitrend/Visiplot	$229
Visidex	$189
Visiterm	$ 79
Visicalc 3-3	$189
Visipak	$539

WE SERVICE AND SUPPORT THE NEW BASIS 108 MICROCOMPUTER

WE STOCK RANA DRIVES

In our opinion, these are the best drives available for your APPLE II. Call for prices.

Hard Disks + 8" Disks for Apple, TRS-80	$CALL

80 COLUMN CARDS FOR APPLE

Wesper 80 Card	$259
Vision 80 Card (Vista)	$279
Videx 80 Card	$249

RAM CARDS

Davong 16K Card	$ 89
Microsoft 16K Card	$129

T and G PRODUCTS

Game paddles	$ 29
Joy Stick	$ 44
Selecta-port Expander	$ 49

STONEWARE

DB Master	$169
DB Utility Pack	$ 69

MICRO PRO

Apple CP/M

Word Star	$219
Super Sort	$119
Mail Merger	$ 79
Data Star	$179
Spell Star	$119
Calc Star	$119

APPLE WORD PROCESSING *On line s Sensational*

Screenwriter II	**$89**

Call for Continental, Dakin 5, Broderbund, Automated Simulations, Avant-Garde, Edu-Ware, Denver, Howard, Sirius, Sensible, Synergistic Software, Etc.

MODEMS FOR APPLE

Hayes Micromodem II	$279
Novation Apple Cat II	$299

MODEM SOFTWARE

Visiterm	$ 79
Transend II	$119

(Complete with a FREE subscription to the SOURCE)

CPM FOR APPLE

Microsoft Z80 Softcard	$269

MISCELLANEOUS APPLE PRODUCTS

Enhancer II	$119
Dana Apple Fan	$ 39
Sup R Mod	$27.95
System Saver	$ 79

CALL FOR PRICES ON

APPLE II FRANKLIN ACE BASIS 108

ATARI

ATARI	800 Computer	$675
	810 Disk Drives	$459
	850 Interface Module	$189
	830 Acoustic Modem	$169
	16K Memory Module	$ 89
	32K Memory Module	$ 99
	Paddle Controller (Pair)	$ 19
	Joystick Controller (Pair)	$ 19

ATARI SOFTWARE

Conversational French/German/Italian/Spanish, each module	$ 49
Touch Typing	$19.95
Asteroids	$35.95
Centipede	$35.95
Missile Command	$35.95
Pac-Man	$35.95
Space Invaders	$35.95
Star Raiders	$39.95

NEC PERSONAL COMPUTER

PC-8001A	Keyboard and processor unit, including 32K Ram, 24KB N-Basic Rom, cassette tape recorder interface, parallel printer interface, display interface	$749
PC-8012A	Modular expansion unit, including I/O bus extension, diskette adaptor, 32KB Ram, real-time clock, 8 priority interrupt levels, 6 slots for additional boards	$479
PC-8023A	Dot matrix printer—100 cps, bidirectional printing, proportional printer	$499
PC-8031A	Dual diskette unit, including two 163K byte diskette drives, interface cable, enclosure and operating system	$749

We carry the entire line of NEC/BPI software for the personal computer.
Please call or write for information.

CALL OR WRITE FOR OUR IBM/APPLE/NEC/ATARI CATALOG

IN COLORADO (303) 279-2727 — (303) 279-2848

SHOWROOMS:

1140 S. Colorado Blvd.
Denver, CO 80222

1019 8th Street
Golden, CO 80401

CALL "THE COMPUTER-LINE"™

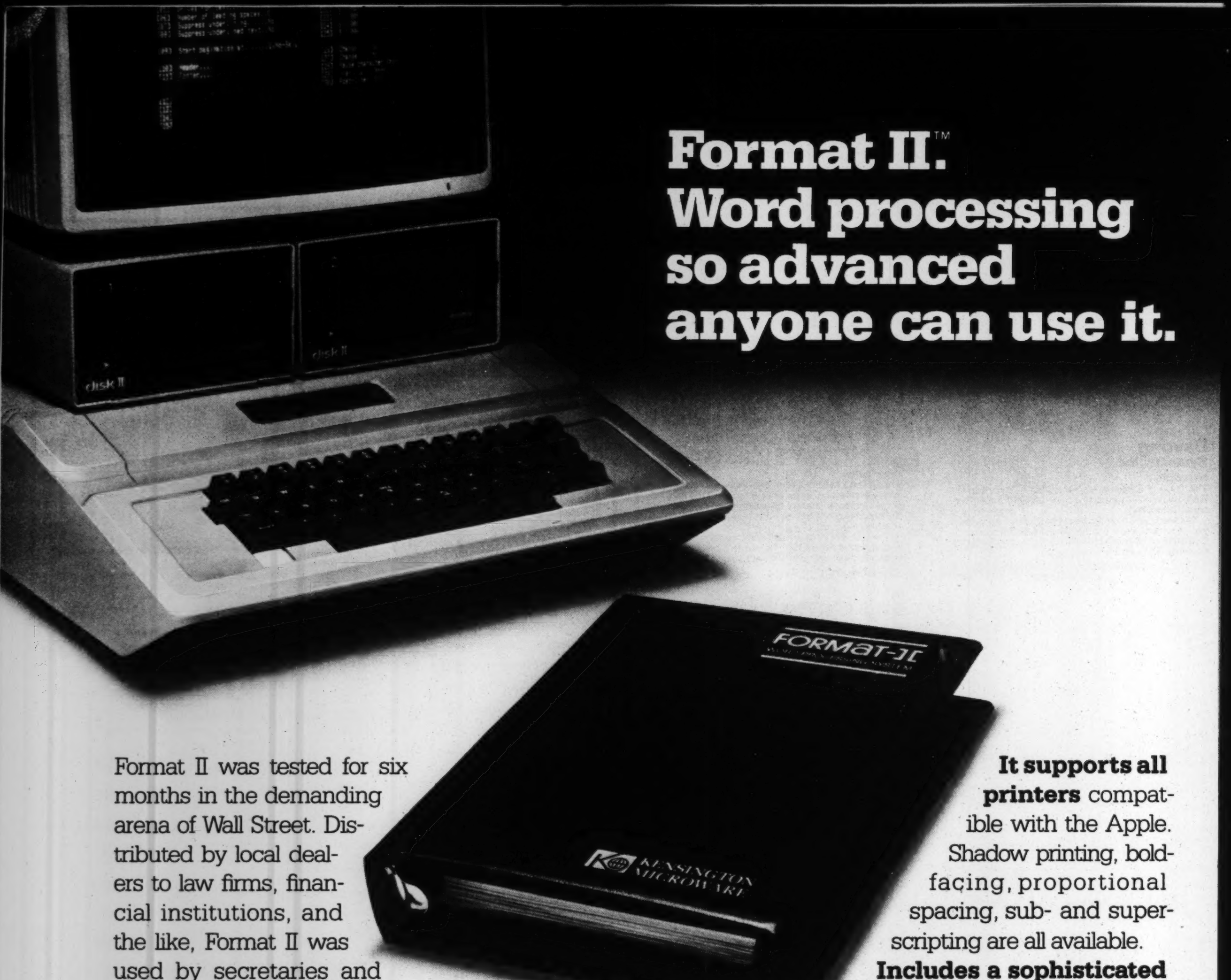
1-(800)-525-7877

COMPUTERWORLD INTERNATIONAL, INC.
SUITE 133, P.O. BOX 81, WHEAT RIDGE, COLORADO, U.S.A. 80034-0081

TERMS: RETAIL/MAIL ORDER: ADD 1% SHIPPING (MINIMUM $2.50) - UPS GROUND. WE HONOR ALL MANUFACTURERS WARRANTIES AND EXCHANGE FAULTY GOODS IMMEDIATELY. SPECIALISTS IN APO AND INTERNATIONAL DELIVERIES.

CIRCLE 155 ON READER SERVICE CARD

Format II.™ Word processing so advanced anyone can use it.



Format II was tested for six months in the demanding arena of Wall Street. Distributed by local dealers to law firms, financial institutions, and the like, Format II was used by secretaries and non-technical personnel. Overwhelmingly, Format II was recognized as one of the easiest and most effective word processing systems available *in any form.*

Here's why Format II is unique among word processing programs:

What you see is what you get. Format II performs virtually any editing and formatting function you can imagine and displays on the screen the text exactly as it will print out—paragraphs, underlining, justification, page breaks.

Simple to Use. You edit and format text with single key strokes. "D" for delete, "E" for edit, "I" for insert, "J" for justify, etc. Easy-to-remember commands because they make sense.

It supports all printers compatible with the Apple. Shadow printing, boldfacing, proportional spacing, sub- and superscripting are all available.

Includes a sophisticated Mailing List. Stores and retrieves names and addresses which may be printed on labels or incorporated into documents. Powerful "logic" commands allow you to select only those records which match specified criteria.

And more. Format II is lightning fast and menu driven. Add them all together and it's clear why Format II has generated such enthusiasm. Now, at a cost of $250, you *too* can buy the best.

Format II is available from most local dealers. If not, ask them to contact us, or order directly and receive a 30 day money-back guarantee.

Kensington Microware Ltd., 300 East 54 St., Suite 3L, New York, NY 10022, (212) 486-2802.

KENSINGTON
MICROWARE

System Requirements: 48K Apple® II Plus with 80 column card.

CIRCLE 214 ON READER SERVICE CARD

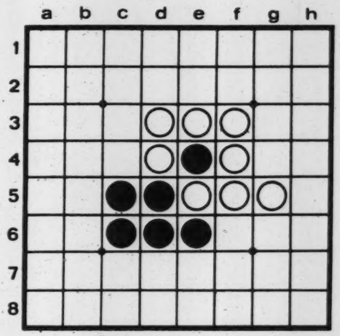


Diagram 3. Black to play at move 11. Cerf chose g4.

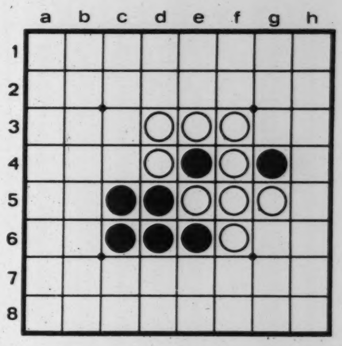


Diagram 4. Position after Mimura's 12-f6.

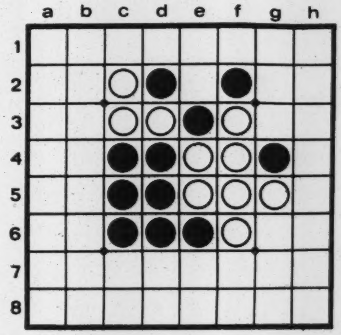


Diagram 5. White to play at move 18.

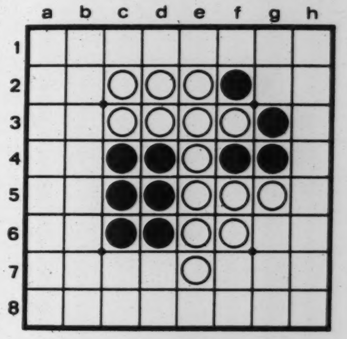


Diagram 6. After White's 20-e6.

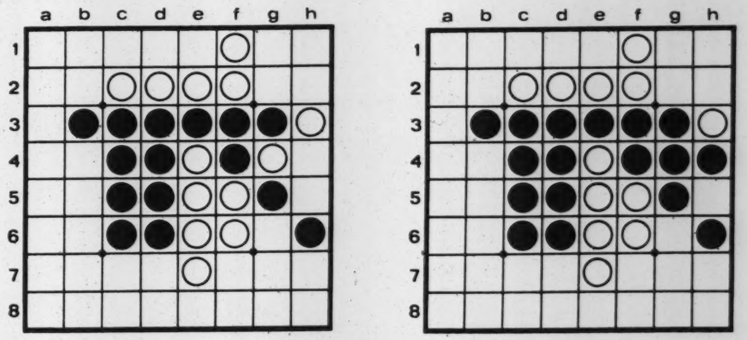


Diagram 7. Before and after Cerf's 25-h4.

in favor of 11-g4 (Diagram 3). The g4 move gives Black an uncomfortable disc majority, but it stood up pretty well in the half dozen or so continuations I had time to explore.

Through move 11 Mimura and I had been playing preplanned moves—we had each used less than thirty seconds out of thirty-minute allotments. But now things began to slow down. After Mimura's 12-f6 (Diagram 4), I considered going to g3. What makes the g3 possibility so attractive is that it doesn't alter the overall position very much—a new black disk at g3 would only slightly extend my exposure on the eastern frontier, would make only one new square immediately accessible to White (X-square g2), and would actually eliminate one of White's present options (g3 itself). However, I was concerned that moving now to g3 might interfere with my long-term hopes for row 2. Accordingly, I set out to develop the northern frontier before taking the g3 move. Note that after 13-c4 and 14-c3, 15-d2 did not flip the disc at e3 (if a prior move to g3 had left f4 back, then the d2 move would have flipped e3, making the play prohibitively messy).

My move 17 to f2 may not have been the best choice—b4 or g3 might have been better—but, in any case, Mimura faced a difficult problem at move 18 (Diagram 5). The problem is that e2 looks like a great next move for Black. Like the g3 move discussed above, a Black move to e2 would offer White virtually nothing in the way of new opportunities. As a general rule, when your opponent threatens to make a disconcertingly "quiet" move, there are several things you can do. You may be able to afford to let the move happen if you can respond with a similarly quiet move of your own, but otherwise you should try to stop or discourage the move in one of three ways: deny your opponent access to the threatened square by knocking out the disc he intends to use at the passive end of his flipping line, poison the move by arranging for there to be a solid line of your own discs between the threatened square and some distant opposing piece (this may involve filling in a gap or changing the color of an interposing opponent's piece), or prevent the move by occupying the threatened square yourself. In the case at hand, White cannot deny Black access to e2 because he cannot simultaneously knock out the black disks at c4 and g4. Neither is there any way for White to poison e2 for Black. So Mimura's only chance to prevent the move was to occupy e2 himself, which he did, even though this entailed flipping the frontier disc at d2.

At move 19 I finally took the deferred move to g3, and Mimura responded with 20-e7. Note that in the resulting position (Diagram 6) Mimura is protected against the normal Black continuation 21-d7 since this move would open up a good response for White at g6.

Moves 21-30

I was not particularly pleased with any of my options at move 21. I didn't want to do anything that would give Mimura access to g6, I didn't want to flip the disc at e7 because that disc was poisoning Mimura's b4 option, and I didn't want to try b3 because I couldn't find a good answer to Mimura's probable h3 response. I narrowed the choice down to f1 and h6, and then I guessed.

After Mimura's 22-f1 I chose 23-b3 figuring that with a black disc in place at h6 I could now deal satisfactorily with Mimura's possible h3 reply. It's not clear whether Mimura should ever have gone to h3, but, if he was intent on occupying h3, move 24 with row 3 solidly black was the right time to do it—a later White move to h3 would undoubtedly have flipped the disc at g3.

I'm confident my move 25 to h4 was correct (Diagram 7.) I had to be sure of getting the last move on the right-hand side because I couldn't afford to initiate

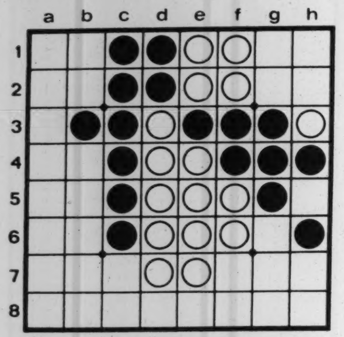


Diagram 8. White to play at move 30.

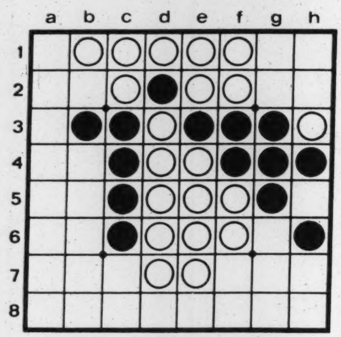


Diagram 9. After Mimura's 30-b1.

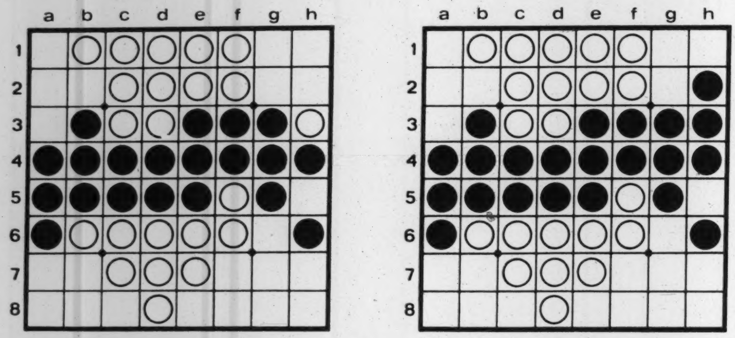


Diagram 10. Before and after Cerf's 39- h2.

play anywhere else—my overall position being extremely precarious. The h4 move seemed preferable to h5 because it soured Mimura's h2 option and also because it gave me access to h2—an advantage that seemed insignificant at the time, but which later turned out to be very important.

Mimura now underwent an experience on the top edge that was very similar to the unpleasantness I had suffered on the right-hand side. Following his 26-d7, I postponed making the natural c7 response in order to capitalize on the now-or-never opportunity to go to d1 without flipping d2 (much as he had gone to h3 without flipping g3). Shortly thereafter, at move 30 (Diagram 8), Mimura faced the choice of allowing me the last move on the top edge or accepting an unbalanced edge with a move to b1. Apparently taking into account the precariousness of his center-board configuration, Mimura seems to have concluded that he couldn't afford to give me the last move on the top. Diagram 9 shows the position after his 30-b1. Note that by moving at any time to h5 Mimura could have induced me to accept an unbalanced edge of my own from h2 to h6. However, my position would have been slightly preferable to his, partly because g6 remained vacant and partly because Mimura could never have used my weak edge to mount an attack on corner h1 without exposing himself to a retaliatory attack on corner a1 via a Black wedge at g1.

Moves 31-60

When I played c7 at move 31, I expected Mimura to try 32-a3, to which I tentatively planned to reply 33-b4. After that, I anticipated 34-a4 leaving me without access to b5 and therefore no obvious response. Consequently, I was relieved when Mimura rejected 32-a3 in favor of 32-b4.

Mimura's moves 34 and 36 look a little peculiar, but they successfully advanced several reasonable objectives. He must have been taking care to keep my g6 option at all times poisoned, and I suspect he may also have been trying to lure me into a move to a7, which would have defused my long-term threat on corner a1 by exposing me to a potential counterattack on corner a8 via a wedge at a2-a3. Furthermore, his 36-b6 gave him access to d8 at move 38, which might have proved significant if I had been forced to follow his lead to the bottom edge.

My position looked terrific after move 38, so at move 39 (Diagram 10), with no good prospects for improving the situation with subtle tinkerings, I went for the throat with a move to h2. The position was still slightly too complex for me to be sure I had the game won, but I was starting to get very excited. I planned to go to g2 if Mimura tried 40-h5 and then of course 43-g1 if he continued with 42-h1. Alterna-

The Voice.™ Give your Apple a Voice for Christmas and listen to your family cheer.

This Christmas combine your imagination with The Voice from Muse and let your Apple II do the talking.

The Voice gives your Apple the gift of speech and allows it to speak from any Basic Program through your Print Commands. You can use the vocabulary provided or program your own words to give it virtually unlimited speech capability. Each disk stores up to 80 words and phrases. Simply add blank disks as you need them.

Look for the special Christmas Package. From Muse

The Voice says it all.

For Apple II™ or Apple II Plus™ with 48k.

$39.95

At your local computer store. Write or call Muse for information and the dealer nearest you.

MUSE
SOFTWARE™
347 N. Charles St.
Baltimore, MD 21201
(301) 659-7212

Apple II is a trademark of Apple Computer Corp.

CIRCLE 246 ON READER SERVICE CARD

APPLE • ALTOS • ATARI • MAXELL • DYSAN • EPSON • CCS • SHARP • CASIO • HP • VERBATIM • MEMOREX • SOROC • CORVUS • ADDS

MICRO

BUSINESS WORLD INC.
Information Line (213) 996-2252
TOLL FREE MAIL ORDER LINES
(800) 423-5886 Outside Calif.

LE MONITOR

9" GRN PHS MSL 189.00	12" GRN PHS MSL 189.00
OUR PRICE 88.00 Save $101.00	OUR PRICE 119.00 Save $70.00

METAL CABINET

SPECIAL OF THE MONTH GRAPHICS

Add a Genie in Your Computer Intelligent Printer Interface Card

Works With
- Integer Basic
- Applesoft*
- Pascal 1.0 & 1.1
- CP/M**

OUR PRICE
$119.00
MSL 159.00
Save
40.00

*Applesoft is a registered Trademark of Apple Computer, Inc.
**CP/M is a registered trademark of Digital Research.

MICRO-SCI

APPLE II+ COMPATIBLE DRIVE

W/ CONTROLLER		W/O CONTROLLER	
MSL	OUR PRICE	MSL	OUR PRICE
549.00	429.00	449.00	379.00
Save 216.00	COMPARE TO APPLE DRIVE	Save 146.00	COMPARE TO APPLE DRIVE

APPLE IS A REG. TRADE MARK OF APPLE COMPUTER

IBM PERSONAL COMPUTER

INCLUDES:
2 Drives DS/DD
Color Graphic Board
64K Memory
12" BMC GRN PHS

MSL 3305.00
OUR PRICE $2895.00
Save 410.00
*Subject to availability

APPLE II PLUS 48K

*Subject to availability

MSL 1530.00
$1095.00
Save 435.00

APPLE IS A REG. TRADEMARK OF APPLE COMPUTER

THE APPLE COMPATIBLE ALTERNATIVE

FRANKLIN BUSINESS SYSTEM

Franklin Ace 1000 system • 64K • Disk Drive with controller card • 12" green phs. video monitor.
Color optional $49.00

$1695.00

SAVE $1000 COMPARED TO APPLE SYSTEM

OSBORNE PERSONAL COMPUTER

INCLUDES SOFTWARE

- CPM
- MAIL MERGE
- WORDSTAR
- CB BASIC
- SUPERCALC
- M BASIC

MSL 1795.00
OUR PRICE 1595.00
Save $200.00

NEC STUDENT SYSTEM 64K

*NEC PC 80001
*NEC PC 8012
*NEC PC 8031
12" Grn. Phs. Video Monitor

MSL 2839.00
OUR PRICE $2095.00
Save 744.00

RADIO SHACK TRS 80 MOD III

48K 2 DRIVE

MSL 2495.00
OUR PRICE $1733.00
Save 762.00

commodore STUDENT SYSTEM

4032 - 32K 40 COL CRT
4940 - DUAL DISK DRIVE

MSL 2590.00
OUR PRICE $1978.00
Save 612.00

APPLE ACCESSORIES

	MSL	Our Price
Prometheus Versacard	$ 295.00	$ 209.00
CPS Multi Function Card	235.00	105.00
Videx Video Term 80 Column Card	349.00	239.00
Videx Keyboard Enhancer (orig)	99.00	74.00
Videx Keyboard Enhancer II	149.00	119.00
Z-80 Softcard by Microsoft	395.00	277.00
16K Ramcard by Microsoft	195.00	149.00
Thunderclock/Calendar Card	149.00	109.00
Smartmodem 80 Column Card	349.00	277.00
Corvus Winchester 5MB Disk	3195.00	2900.00
Corvus Winchester 10MB Disk	4995.00	4250.00
Corvus Winchester 20MB Disk	5995.00	5100.00
ALF 3 Voice Music Card	249.00	177.00
ALF 9 Voice Music Card	195.00	145.00
Joysticks By Keyboard Co	65.00	44.00
2 3 Key Numeric Keypad by	149.00	112.00
Music System (16 voices) Mntn	395.00	288.00
A/D+D/A Interface by Mountain	349.00	267.00
Expansion Chassis (8 slots)	449.00	365.00
C Lock/Calendar Card by Mountn	280.00	219.00
Supertalker SD-200 by Mountain	195.00	145.00
Romplus + Card	175.00	119.00
Romwriter Card	195.00	137.00
Ramplus 32K Ram Add-On(w/16k)	195.00	137.00
Sup-R-Fan	65.00	45.00
Sup-R-Terminal 80 Column Card	395.00	288.00
Versawriter Digitizer Tablet	349.00	245.00
A Sychronous Serial Card by CCS	175.00	135.00
Centronics Parallel Card by CCS	135.00	109.00
Grappler Printer Interfaces	175.00	135.00
SVA 2+2 Sgl. Den 8" Disk Cont		
SVA ZVX4 Megabyter 8" Disk Cont		
Apple Cache 256K By SVA		
IEEE-488 Interface by SSM	495.00	377.00

APPLE SOFTWARE

	MSL	Our Price
Visicalc Apple Dos 3.3	$ 250.00	$ 180.00
Visidex	250.00	180.00
Visiplot	200.00	150.00
Visiterm	125.00	75.00
Visitrend	260.00	197.00
Visifile	250.00	180.00
Desktop Plan II	250.00	180.00
Desktop Plan III	200.00	149.00
Visipack	750.00	588.00

IBM PERSONAL COMPUTER

PERIPHERALS & SOFTWARE

HARDWARE	MSL	Our Price
CORVUS Hard Disk 5MB	$3195.00	$2795.00
Microsoft		
64K Ram Card	399.00	369.00
128K Ram Card	599.00	475.00
256K Ram Card	995.00	777.00
64K Ram chips	195.00	155.00
Quadram		
Quad Ram 256K,4 function brd	995.00	675.00
TG Products		
Joystick	65.00	47.00
SOFTWARE		
Automated Sim. Temple of Apshai	35.00	28.00
Cavalier Championship Blackjacks	35.00	28.00
Continental Home Accountant Plus	149.00	109.00
Denver Easy (Exec. Accounting Sys.)	695.00	535.00
Infocom Deadline	35.00	27.00
Innovative T.I.M. III (a DBMS)	450.00	355.00
ISM Mathmagic	75.00	65.00
Info Unlimited		
Easy writer II	350.00	269.00
Phone Support of Easywriter II	350.00	260.00
Easyspeller (88K words)	150.00	119.00
Easyfiler (aDBMS)	400.00	289.00
Micro Pro Wordstar	495.00	229.00
Sorcim Superwriter	395.00	289.00
Super Calc	295.00	210.00
Visicorp Visicalc	200.00	155.00
Visicalc/256K	250.00	189.00
Desktop Plan I	300.00	240.00
VisiTrend/Plot	300.00	240.00
VisiDex	250.00	199.00
VisiFile	250.00	199.00
VersaWriter Graphics Tablet	299.00	255.00
Conquest	29.95	24.00
Frogger	34.95	29.00
The Tax Manager	250.00	199.00
Galaxy	25.00	21.00
Midway Campaign	21.00	17.95
Computer Stocks and Bonds	25.00	21.00
Voyager	25.00	21.00
Draw Poker	21.00	17.95
Lost Colony	21.95	23.95

MONITORS

	List	Our Price
BMC		
12" Grn. Phs KQ (15 Hz)	219.00	165.00
12" Grn. Phs EO (18 Hz)	$249.00	185.00
12" Grn Phs (20 Hz)	279.00	209.00
12" Colour Compusite Hi Res.	439.00	319.00
Grn. Phs 12"	275.00	165.00
NEC Grn. Phs. 12"	225.00	179.00
Zenith 12"	159.00	119.00

HEWLETT PACKARD

HP-11C Slim-Line Advanced	135.00	119.00
HP-12C Slim-Line Financial	150.00	129.00
HP-41 CV New 2.2 Bytes Mem	325.00	250.00
HP-41-C Calculator	250.00	185.00
Card Reader For 41CV/C	215.00	162.00
Printer For 41CV/C	385.00	289.00
Optical Wand For 41 CV/C	125.00	97.00
Quad Ram Equals 4 Mem. Mods	95.00	81.00
Memory Modules For 41C		25.00
HP-97 Programble Printer	750.00	595.00
HP-67 Programble Calculator	375.00	295.00
HP-34C Programble Scientific	150.00	117.00
HP-38C Programble Bus. R/E	150.00	117.00
HP-32E Adv. Scientific	55.00	48.00
HP-37E Business Mgmt.	75.00	57.00

MONITORS

NEC		
Nec 12" Hi Res Green Monitor	210.00	165.00
Nec 12" Composite Color Monitor	449.00	345.00
SANYO		
Sanyo 9" B & W	225.00	165.00
Sanyo 9" Green Monitor	225.00	169.00
Sanyo 12" B & W	275.00	185.00
Sanyo 12" Green (New Case Style)	320.00	249.00
Sanyo 13" Color Monitor	489.00	359.00
ZENITH		
Zenith 12" Green Monitor	159.00	119.00

PRINTERS

EPSON	MSL	Our Price
Epson MX-80 T Type III w/graphics	645.00	429.00
Epson MX-80F/T Type III w/graphics	745.00	525.00
Epson MX-100 Type III w/graphics	995.00	669.00
OKIDATA		
Okidata 82A w/tractor 80 col	649.00	457.00
Okidata 83A W/tractor 132 col	995.00	719.00
Okidata 84A 132 col. serial	1495.00	1177.00
Okidata 84A 132 col. parallel	1395.00	1019.00
C. ITOH		
C. Itoh F 10 40 cps (parallel)	1795.00	1377.00
C. Itoh F 10 40 cps (serial)		1439.00
C. Itoh Prowriter (parallel)	695.00	519.00
C. Itoh Prowriter (serial)	749.00	565.00

DRIVES

5¼" FLOPPY DISK DRIVES

		MSL	Our Price
For the IBM Personal Tandon TM 100-1	Single-Sided 48TP1	$295.00	$239.00
For IBM/Northstar/Cromemco Tandon TM100-2	Dual-sided. 48TP1	395.00	319.00

5¼" WINCHESTER DRIVES

Seagate ST 506	6.38Mb	1500.00	1179.00
Seagate ST 412	12.76Mb	1750.00	1275.00
Tandon TM 602	6.4Mb	1395.00	1079.00
Tandon TM 603	9.6Mb	1500.00	1179.00

WE RESERVE THE RIGHT TO CORRECT TYPOGRAPHICAL ERRORS.
THIS AD SUPERCEDES ALL PREVIOUS ADS.

MICRO MAIL ORDER

20929 Ventura Blvd.
Woodland Hills, Ca. 91364

Telex: 182852
Answer: MICKO TZNA

OUTSIDE CA CALL TOLL FREE 1 (800) 423-5886 IN CA (213) 996-2252

*California residents add 6% sales tax.

**Add 3% Shipping & Handling — Add 3% surcharge for credit cards. Orders cannot be shipped unless accompanied by payment, including shipping, handling and tax where applicable.

Name (Please print) ____________
Address ____________
City ____________ State ____________ Zip ____________

Qty	Make	Model	Description	Price	Total

TOTAL ORDER $ ____________
TAX IF APPLICABLE* ____________
SHIPPING & HANDLING** ____________
TOTAL ENCLOSED $ ____________

☐ **Certified Check or M.O.**
☐ **Bank Wire Transfer**
☐ **Allow 2 weeks clearance for personal check**

VISA MasterCard

CREDIT CARD # ____________
Exp. Date ____________ Signature ____________

MAXELL • DYSAN • EPSON • CCS • SHARP • CASIO • HP • VERBATIM • MEMOREX • SOROC • CORVUS • PERSONAL SOFTWARE • CCS

BMC • CENTRONIC • NEC • HAZELTINE • AMPEX • VERBATIM • HITACHI • HAYDEN • CANON • NOVATION • D.C. HAYS MICROCOMPUTERS • PAPER TIGER • PERSONAL SOFTWARE • GTE •

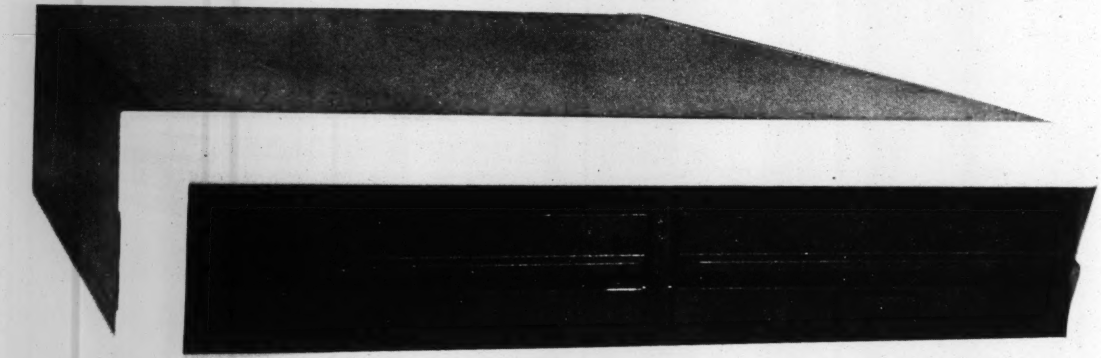
HP • D.C. HAYS MICROCOMPUTERS • PAPER TIGER • GTE • DIABLO • BMC • CENTRONIC • NEC • HAZELTINE • MEMOREX • AMPEX • PERSONAL SOFTWARE • ADDS • XEROX • DIABLO

CIRCLE 230 ON READER SERVICE CARD

• ANNOUNCING •
CI 1220

TWO MEGA-BYTE FLOPPY DISK SYSTEM FOR LSI-11 BASED SYSTEMS
DUAL DRIVE — DOUBLE DENSITY — DOUBLE SIDED

- DEC RX02/RX01 COMPATIBLE
- COMPATIBLE WITH LSI 11/2 OR LSI-11/23
- DUAL WIDTH DMA CONTROLLER
- BOOTSTRAP, DIAGNOSTICS PROVIDED, RACK MOUNT ENCLOSURE
- 3 MONTH WARRANTY, PARTS AND LABOR



TWO MEGABYTES FOR LESS THAN THE PRICE OF ONE.

The CI 1220 is completely compatible with DEC operating systems using DEC RX03 protocol and DEC standard DY handler. Compatible with RX01/RX02 media, IBM 3740 format. Dual width controller operates at +5VDC @ 2.7A supplied from LSI-11 backplane and is compatible with any Shugart interface floppy drive.

DON'T ASK WHY WE CHARGE SO LITTLE, ASK WHY THEY CHARGE SO MUCH.

Chrislin Industries, Inc.
31352 Via Colinas • Westlake Village, CA 91362 • 213-991-2254
TWX 910-494-1253 (CHRISLIN WKVG)

CIRCLE 136 ON READER SERVICE CARD

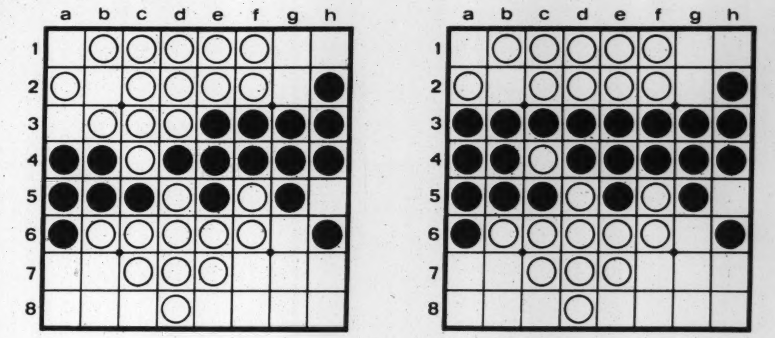


Diagram 11. Before and after Cerf's 41-a3.

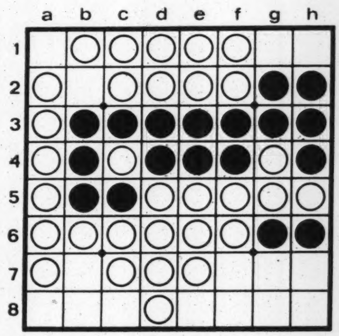


Diagram 12. White to play at move 18.

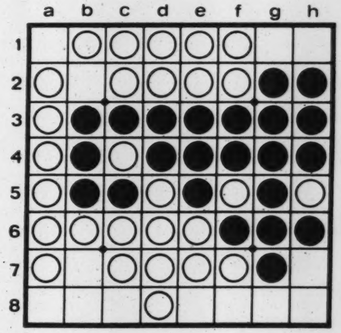


Diagram 13. Position after hypothetical 47-g7.

tively, if he played 40-a3, I saw nothing wrong with 41-a2. If instead Mimura tried 40-g2, 41-f7 looked like an adequate response, or if he played 40-b2, then 41-a1 seemed acceptable. However, Mimura rejected all of the above options in favor of 40-a2, and because I shared his view that this was his most promising play, I had given this line more thought than the others.

I might have been able to get away with a7 at move 41, but to me a3 looked like a much better play (Diagram 11). 41-a3 completely eliminated the threat of a White wedge at a2-a3 and virtually forced Mimura to respond with a7, thus offering me a potential second corner, a8, in return for the one I was trying to give away, h1. Also, in going to a7 Mimura had to flip the black disc at a6 which had been poisoning my g6 option. As if this weren't enough, a couple of moves later 41-a3 paid me still another dividend. At move 46 (Diagram 12), Mimura was unable to effectively delay and perhaps ultimately escape the h1-a1 corner exchange with a move to f7 because of the threat of a Black g7 response—a threat made possible by move 41 which had simplified the a1-a8 diagonal. Diagram 13 shows the position that would have resulted from 46-f7, 47-g7. From this position White would have had only three options—b2 (giving Black access to corner a1), h1 (offering Black a wedge at g1), and h7 (surrendering corner h8). Therefore, at move 46 Mimura declined to try f7, choosing instead b2 as the best of a bad lot. It was now clear that he could not prevent me from gaining access to corner a1.

And the rest was easy. ☐

SAM'S GARAGE
SAM
©CREATIVE COMPUTING

"Here smart alec. You diagnosed it, you fix it."

The real flavor of professional football can be yours. NEXA's Superbowl Football lets you design your own original plays (passing and running routes, tackle assignments and formations, etc.) which are graphically displayed on screen.

To make your game spicier, NEXA matches the offense against a 30 second time limit in which to select and execute a play.

Experience penalties, fumbles, ball lateralling in midplay, and even interceptions, all accompanied by cheering crowds.

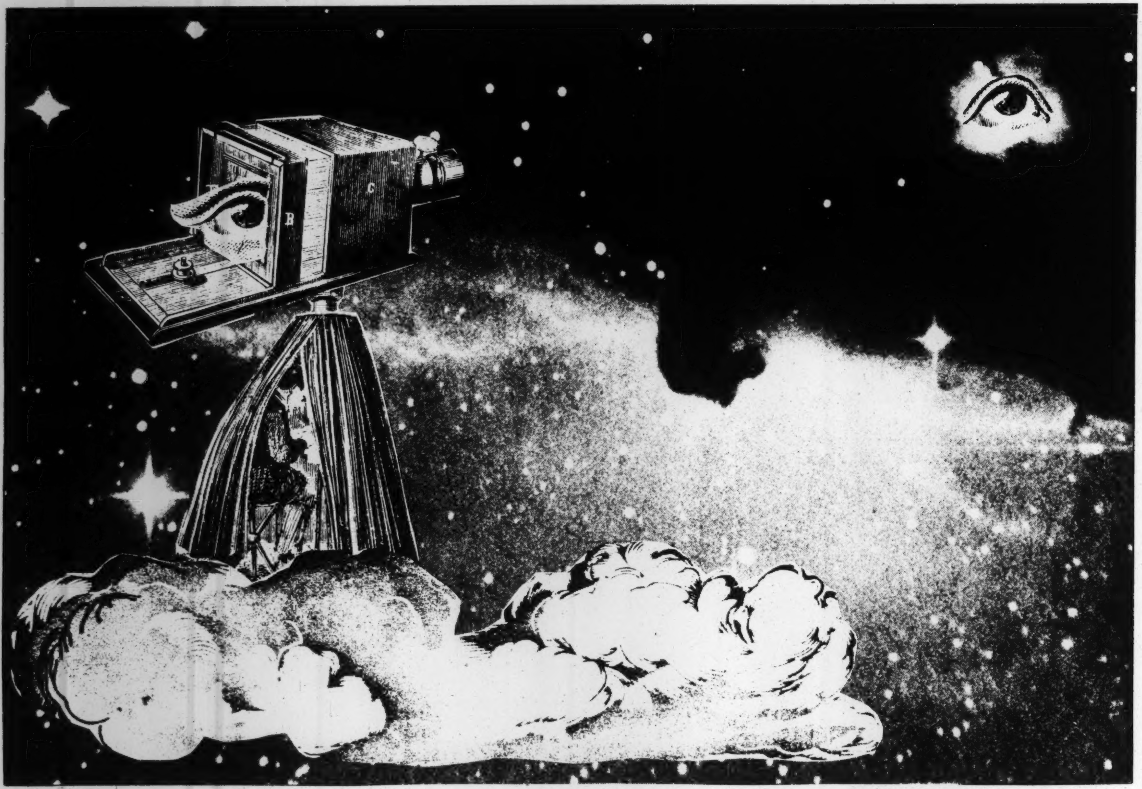
Other treats in Superbowl Football include, individual control over the ball carrier, the choice of naming your players, and individual statistics at the end of each game.

(Atari 400/800 w/48K & IBM PC)

For other NEXA taste sensations, write for information on all our creative games.

NEXA
CORP.
P.O. Box 26468
San Francisco, Ca. 94126-6468
(415) 387-5800

CIRCLE 250 ON READER SERVICE CARD



Paul J. J. Payack & Peter Payack 1981

Picturing Infinity

Peter Payack

Carefully following the instruction manual
 that came with my new camera,
I experimented with a whole range of lens settings
as I shot a motley assortment of things,
 zooming in for artistic close-ups
and then, for shots of objects more than 25 feet away,
adjusting the setting to maximum focus.

A week later I got the prints back from the developer.
I was surprised the pictures were not only of earthly things
 like my cats, a newly planted peach tree,
 the neighbor's '57 Chevy, the compost heap
 decomposing, the bird feeder, and a close-up
 of a caterpillar in mid-slink,
but were also of some heavenly bodies—
 the planet Saturn with its silver rings, Polaris,
 Halley's Comet (most unspectacular as it was located
 somewhere beyond Pluto), the Horse Head Nebula,
 a local band of meteors, the Galilean moons of Jupiter,
 a white dwarf orbiting a Red Giant
and one blank print which at first I thought didn't come out,
but it was probably a Black Hole!

I was thrilled but somewhat bewildered
 by these stunning developments,
until I remembered that, indeed, I had set
 the lens to maximum—"infinity"!

Then disappointment set in.
As it was, the farthest object that I got a print of
 was the Andromeda Galaxy
which at a distance of 2 million light years
 isn't exactly infinity,
but after all,
my camera is only a pocket instamatic. ☐

Peter Payack, 64 Highland Ave., Cambridge, MA 02139.

256K Card for IBM $299.95*

Printers on Sale

NEW EPSONS with GRAFTRAX-plus

MX-80FT with GRAFTRAX-plus *same as MX-80 with friction feed and pin feed.*

PRM-28082	*MX-80FT w/GRAFTRAX-plus*	**$539.95**

MX-100 with GRAFTRAX-plus *132/232 column, correspondence quality, up to 15" paper, friction feed & adjustable pin feed, 18 x 18 dot matrix, 80 CPS.*

PRM-28100	*MX-100 w/GRAFTRAX-plus*	**$729.95**

PRA-27084	*Serial interface*	**$54.95**
PRA-27088	*Serial intf & 2K buffer*	**$99.95**
PRA-27081	*Apple card*	**$39.95**
PRA-27082	*Apple cable*	**$19.95**
PRA-27086	*IEEE 488 card*	**$59.95**
PRA-27087	*TRS-80 cable*	**$24.95**
PRA-27097	*GRAFTRAX-plus 80*	**$59.95**
PRA-27197	*GRAFTRAX-plus 100*	**$64.95**
PRA-27090	*MX-80, FT print head*	**$44.95**
PRA-27190	*MX-100 print head*	**$49.95**
PRA-27083	*MX-80 ribbon cart.*	**$13.95**
PRA-27101	*MX-100 ribbon only*	**$9.95**

BETTER THAN EPSON ! - Okidata

Microline 82A *80/132 column,* ***120 CPS****, 9 x 9 dot matrix, friction feed, pin feed, adjustable tractor feed (optional), handles 4 part forms up to 9.5" wide, rear & bottom feed, paper tear bar, 100% duty cycle/200,000,000 character print head, bi-directional/logic seeking,* ***both serial & parallel interfaces included****, front panel switch & program control of 10 different form lengths, uses inexpensive spool type ribbons, double width & condensed characters, true lower case descenders & graphics*

PRM-43082	*Friction & pin feed*	**$479.95**

Microline 83A *132/232 column, 120 CPS, forms up to 15" wide, removable tractor, plus all the features of the 82A.*

PRM-43083	*with FREE tractor*	**$699.95**

Microline 84 *132/232 column, Hi-speed 200 CPS, full dot graphics built in, plus all the features of the 83A.*

PRM-43084	*Centronics parallel*	**$1099.95**
PRM-43085	*Serial with 2K buffer*	**$1149.95**

PRA-27081	*Apple card*	**$39.95**
PRA-27082	*Apple cable*	**$19.95**
PRA-27087	*TRS-80 cable*	**$24.95**
PRA-43081	*2K hi speed serial card*	**$99.95**
PRA-43082	*Hi-res graphics ROMs 82A*	**$49.95**
PRA-43083	*Hi-graphics ROMs 83A*	**$49.95**
PRA-43088	*Tractor option for 82A*	**$49.95**
PRA-43080	*Extra ribbons pkg. of 2*	**$9.95**

8023 DOT MATRIX - NEC

100 CPS, proportional spacing, hi-resolution graphics, correspondence quality printing, bi-directional tractor & friction feed.

NEC-8023A	*8023 parallel*	**$499.95**
NEC-8023-01	*8023 ribbon*	**$11.95**

TP-1 LETTER QUALITY - SCM

12 CPS daisy wheel printer from Smith Corona.

PRD-45101	*Centronics parallel*	**$648.95**
PRD-45102	*RS-232C serial*	**$648.95**

LETTER QUALITY PRINTER - Jade

Uses standard daisy wheels and ribbon cartridges, 16 CPS bi-directional printing, semi-automatic paper loader (single sheet or fan fold), 10/12/15 pitch, up to 16" paper, built-in noise suppression cover.

PRD-11001	*Centronics parallel*	**$899.95**
PRD-11002	*RS-232C serial model*	**$969.95**
PRA-11000	*Tractor Option*	**$169.95**

KSR DAISY WHEEL - Anderson-Jacobson

Letter quality communications terminal/printer with full typewriter keyboard, 30 CPS Diablo print mechanism, RS-232 interface, includes free printer stand with deluxe casters, print wheel, ribbon, friction feed standard (tractor feed optional), factory refurbished with 30 day warranty, shipped freight collect.

PRD-99100	*AJ KSR printer*	**$995.00**
PRA-99200	*Tractor option*	*$150.00*

PRINTER PALS - F.M.J. Inc.

Desk top printer stand and continuous form paper holder.

PRA-99080	*for MX-80, MX-80FT, Oki 82A, NEC*	**$29.95**
PRA-99100	*for MX-100, Oki 83A & 84*	**$34.95**
PRA-99700	*for letter quality printers*	**$49.95**

5¼" Disk Drives

Tandon TM100-1	*single-sided double-density 48 TPI*		
MSM-551001		$219.95 ea	2 for **$199.95 ea**
Shugart SA400L	*single-sided double-density 40 track*		
MSM-104000		$234.95 ea	2 for **$224.95 ea**
Shugart SA455	*half-size double-sided 48 TPI*		
MSM-104550		$349.95 ea	2 for **$329.95 ea**
Shugart SA465	*half-size doule-sided 96 TPI*		
MSM-104650		$399.95 ea	2 for **$379.95 ea**
Tandon TM100-2	*double-sided double-density 48 TPI*		
MSM-551002		$294.95 ea	2 for **$269.95 ea**
Shugart SA450	*double-sided double-density 35 track*		
MSM-104500		$349.95 ea	2 for **$329.95 ea**
Tandon TM100-3	*single-sided double-density 96 TPI*		
MSM-551003		$294.95 ea	2 for **$269.95 ea**
Tandon TM100-4	*double-sided double-density 96 TPI*		
MSM-551004		$394.95 ea	2 for **$374.95 ea**
MPI B-51	*single-sided double-density 40 track*		
MSM-155100		$234.95 ea	2 for **$224.95 ea**
MPI B-52	*double-sided double-density 40 track*		
MSM-155200		$344.95 ea	2 for **$334.95 ea**
MPI B-91	*single-sided double-density 77 track*		
MSM-155300		$369.95 ea	2 for **$359.95 ea**
MPI B-92	*double-sided double-density 77 track*		
MSM-155400		$469.95 ea	2 for **$459.95 ea**

5¼" Cabinets with Power Supply

END-000216	*Single cab w/power supply*	**$69.95**
END-000226	*Dual cab w/power supply*	**$94.95**

8" Disk Drives

Shugart SA810	*half-size single-sided double-density*		
MSF-108100		$424.95 ea	2 for **$394.95 ea**
Shugart SA860	*half-size double-sided double-density*		
MSF-108600		$574.95 ea	2 for **$549.95 ea**
Shugart SA801R	*single-sided double-density*		
MSF-10801R		$394.95 ea	2 for **$389.95 ea**
Shugart SA851R	*double-sided double-density*		
MSF-10851R		$554.95 ea	2 for **$529.95 ea**
Tandon TM848-1	*single-sided double-den thin-line*		
MSF-558481		$379.95 ea	2 for **$369.95 ea**
Tandon TM848-2	*double-sided double-den thin-line*		
MSF-558482		$494.95 ea	2 for **$484.95 ea**
Qume DT-8	*double-sided double-density*		
MSF-750080		$524.95 ea	2 for **$498.95 ea**
Mitsubishi M2894-63	*double-sided double-density*		
MSF-289463		$494.95 ea	2 for **$474.95 ea**
Siemens FDD 100-8	*single-sided double-density*		
MSF-201120		$384.95 ea	2 for **$349.95 ea**

Dual Disk Sub-Systems

Disk Sub-Systems - Jade

Handsome metal cabinet with proportionally balanced air flow system, rugged dual drive power supply, power cable kit, power switch, line cord, fuse holder, cooling fan, never-mar rubber feet, all necessary hardware to mount 2-8" disk drives, power supply, and fan, does not include signal cable.

Dual 8" Sub-Assembly Cabinet

END-000420	*Bare cabinet*	**$59.95**
END-000421	*Cabinet kit*	**$225.00**
END-000431	*A & T*	**$359.95**

8" Sub-Systems - Single Sided, Double Density

END-000423	*Kit w/2 FD100-8Ds*	**$975.00**
END-000424	*A & T w/2 FD100-8Ds*	**$1175.00**
END-000433	*Kit w/2 SA-801Rs*	**$999.95**
END-000434	*A & T w/2 SA-801Rs*	**$1195.00**

8" Sub-Systems - Double Sided, Double Density

END-000426	*Kit w/2 DT-8s*	**$1224.95**
END-000427	*A & T w/2 DT-8s*	**$1424.95**
END-000436	*Kit w/2 SA-851Rs*	**$1274.95**
END-000437	*A & T w/2 SA-851Rs*	**$1474.95**

Prices may be slightly higher at our retail locations. Please contact the store in your area for exact pricing.

IBM PC Accessories

512K PC/RAM STACK - Hammond

A high quality, high density memory expansion board for your PC, cool-quiet-reliable operation, full parity checking, unique stacking sockets, expandable from 256K to 512K, MDRIVE high speed RAMdisk software only $25.00 with 256K or 512K board purchase.

MEX-25600A	*256K assembled & tested*	**$795.00**
MEX-51200A	*512K assembled & tested*	**$999.95**
MEX-25600S	*MDRIVE disk emulator*	**$25.00**

256K PC/RAM - Hammond Engineering

* *User expandable from 64K to 256K, same high quality standards as the RAM Stack above, designed for medium memory expansion requirements.*

* **MEX-64000A**	*64K assembled & tested*	**$299.95**
MEX-128000A	*128K assembled & tested*	**$399.95**
MEX-192000A	*192K assembled & tested*	**$499.95**
MEX-256000A	*256K assembled & tested*	**$569.95**

PC/SASI RAM - Hammond Engineering

Three boards in one, 256K of RAM, RS-232 asynchronous serial interface, and a SAST (Shugart Assoc Standard Interface) hard disk interface.

IOX-6000A	*PC/SASI RAM*	**$1095.00**

PC EXTENDER CARD - Computel

High quality extender card with free connectors for IBM PC bus.

TSX-300A	*A & T with connectors*	**$42.95**

WIRE WRAP BOARD - Computel

Highest quality, extremely versatile proto typing board with gold plated card edge for IBM PC.

TSX-310A	*Proto board*	**$59.95**

Jade Bus Probe

THE BUS PROBE - Jade

Inexpensive S-100 Diagnostic Analyzer

So your computer is down. And you don't have an oscilloscope. And you don't have a front panel... You're not alone - most computers have their occasional bad days. But without diagnostic equipment such as an oscilloscope (expensive!) or a front panel (expensive!), it can be very difficult to pinpoint the problem. Even if you have an extender board with a superfast logic probe, you can't see more than one signal at a time. You're stuck, right?

Not anymore; Jade is proud to offer our cost-effective solution to the problems mentioned above: ***THE BUS PROBE.***

Whether you're a hobbyist with a cantankerous kluge or a field technician with an anxious computer owner breathing down your neck, you'll find THE BUS PROBE speeds your repair time remarkably. Just plug in THE BUS PROBE and you'll be able to see all the IEEE S-100 signals in action. THE BUS PROBE allows you to see inputs, outputs, memory reads and writes, instruction fetches, DMA channels, vectored interrupts, 8 or 16 bit wide data transfers, plus the three bus supply voltages.

An on-board pulse generator can provide repetitive resets, interrupts, or wait states, for trouble shooting.

TSX-200B	*Bare board*	**$59.95**
TSX-200K	*Kit*	**$119.95**
TSX-200A	*A&T*	**$149.95**

Place Orders Toll Free

Continental U.S.	*Inside California*
800-421-5500	**800-262-1710**

For Technical Inquires or Customer Service call:

213-973-7707

JADE
Computer Products
4901 W. Rosecrans, Hawthorne, CA 90250

We accept cash, checks, credit cards, or Purchase Orders from qualified firms & institutions. **Minimum prepaid order $15** California residents add 6½% tax. Export customers outside the US or Canada please add 10% to all prices. **Prices and availibility subject to change without notice.** Shipping & handling charges via UPS Ground 50¢/lb, UPS Air $1.00/lb **minimum charge $3.00**

Disk Drive for Apple $289.95

Modems

SIGNALMAN - Anchor

Direct-connect automatic answer/originate selection, 300 Baud full duplex, Bell 103, includes RS-232 cable

IOM-5600A	*Signalman*	**$89.95**

SMARTMODEM - Hayes

Sophisticated direct-connect auto-answer/auto-dial modem, touch-tone or pulse dialing, RS-232C interface, programmable

IOM-5400A	*Smartmodem*	**$224.95**
IOK-1500A	*Hayes Chronograph*	**$218.95**
IOM-2010A	*Micromodem II*	**$328.95**
IOM-2012A	*Terminal program for MMII*	**$89.95**
IOM-1100A	*Micromodem 100*	**$368.95**

APPLE-CAT - Novation

Software selectable 1200 or 300 Baud, direct connect, auto-answer/auto-dial,touch & pulse dialing, auxiliary 3-wire RS-232C serial port for printer

IOM-5232A	*Save $50.00*	**$324.95**

1200 BAUD SMARTMODEM - Hayes

1200 and 300 baud, all the features of the standard Smartmodem plus 1200 baud, 212 compatible, full or half duplex.

IOM-5500A	*Smartmodem 1200*	**$599.95**

1200 BAUD AUTO CAT - Novation

212 Auto Cat, 1200 & 300 baud, auto dial/answer/disconnect, LED readout displays mode, analog/digital loop-back self tests, usable with multi-line phones.

IOM-5231A	*212 Auto Cat*	**$649.95**

Video Monitors

HI-RES 12" GREEN - Zenith

15 MHz bandwith 700 lines/inch, P31 green phosphor, switchable 40 or 80 columns, small, light-weight & portable.

VDM-201201	*List price $189.95*	**$129.95**

12" GREEN SCREEN - NEC

20 MHz bandwidth, P31 phosphor ultra-high resolution video monitor with audio.

VDM-651200	*Deluxe model*	**$199.95**
VDM-651260	*Economy model*	**$149.95**

12" COLOR MONITOR - NEC

High resolution color monitor with audio.

VDC-651212	*Color monitor*	**$389.95**
NEC-1202D	*RGB color monitor*	**$999.95**

13" COLOR MONITORS - BMC

18 MHz RGB & composite video color monitors.

VDC-421320	*13" RGB Color*	**$329.95**
VDC-421310	*13" Composite video*	**$299.95**
VDX-420090	*RGB card for Apple*	**$149.95**

COLOR MONITORS - Amdek

Reasonably priced color video monitors.

VDC-80130	*13" Color I*	**$379.95**
VDC-801320	*13" Color II*	**$894.95**
IOV-2300A	*DVM board for Apple*	**$199.95**

AMBER or GREEN MONITORS - Jade

High resolution 18 MHz compact video monitors.

VDM-751210	*12" Amber phosphor*	**$149.95**
VDM-751220	*12" Green phosphor*	**$139.95**
VDM-750910	*9" Amber phosphor*	**$149.95**
VDM-750920	*9" Green phosphor*	**$139.95**

EPROM Erasers

ULTRA-VIOLET EPROM ERASERS

Inexpensive erasers for industry or home.

XME-3100A	*Spectronics w/o timer*	**$69.50**
XME-3101A	*Spectronics with timer*	**$94.50**
XME-3200A	*Economy model*	**$39.95**

Single User System

THREE BOARD SET - SD Systems

4 MHz Z-80A CPU, 64K RAM (optional 256K), serial I/O port, parallel I/O port, double density disk controller, CP/M 2.2 & manual set, system monitor, control & diagnostic software. Includes SBC-200, 64K ExpandoRAM II, Versafloppy II, & CP/M 2.2 - all boards are assembled & tested.

Board set with 64K of RAM	**$1095.00**
Board set with 256K of RAM	**$1295.00**

Apple II Accessories

APPLE DISK DRIVE - Fourth Dimension

Totally Apple' compatible, 143,360 bytes per drive on DOS 3.3, half-track capability - reads all Apple software, plugs right in to Apple controller as second drive, DOS 3.3, 3.2.1, Pascal, & CP/M compatible.

MSM-123200	*40 Track add on Apple drive*	**$289.95**
MSM-123200	*Controller with free DOS 3.3*	**$99.95**

16K RAM CARD - for Apple II

Expand your Apple II to 64K, use as language card, full 1 year warranty. Why spend $175.00 ?

MEX-16700A	*Save over $100.00*	**$69.95**

Z-80 CPU CARD - for Apple II

Two computers in one, Z-80 & 6502, more than doubles the power and potential of your Apple, includes Z-80 CPU card CP/M and complete manual set.

CPX-62800A	*A & T with software*	**$249.95**

APPLE-CAT - Novation

Software selectable 1200 or 300 baud, direct connect, auto-answer/auto-dial, auxiliary 3-wire RS232C serial port for printer.

IOM-5232A	*Save $50.00!!!*	**$325.95**

8" DISK CONTROLLER - Vista

New from Vista Computer, single or double sided, single or double density, compatible with DOS 3.2/3.3, Pascal, & CP/M 2.2, Shugart & Qume compatible

IOD-2700A	*A & T*	**$499.95**

2 MEGABYTES for Apple II

Complete package includes: Two 8" double-density disk drives, Vista double-density 8" disk controller, cabinet, power supply, & cables, DOS 3.2/3.3, CP/M 2.2, & Pascal compatible.

1 MegaByte Package	*Kit*	**$1495.00**
1 MegaByte Package	*A & T*	**$1695.00**
2 MegaByte Package	*Kit*	**$1795.00**
2 MegaByte Package	*A & T*	**$1995.95**

VISION 80 - Vista Computer

80 column x 24 line video card for Apple II, 128 ASCII characters, upper and lower case, 9 x 10 dot matrix with 3 dot descenders, standard data media terminal control codes, CP/M Pascal & Fortran compatible, 50/60 Hz

IOV-2400A	*Vista Vision 80*	**$299.95**

CPS MULTICARD - Mtn. Computer

Three cards in one! Real time clock/calendar, serial interface, & parallel interface - all on one card.

IOX-2300A	*A & T*	**$179.95**

HI-RES GRAPHICS CARD - Genie

Intelligent printer interface and control card allows full high resolution graphics and screen dumps.

IOP-2405A	*Genie for Epson*	**$119.95**
IOP-2410A	*Genie for Okidata*	**$119.95**
IOP-2415A	*Genie for NEC/C. Itoh*	**$119.95**

Power Strips

ISOBAR - GSC

Isolates & protects your valuable equipment from high voltage spikes & AC line noise, inductive isolated ground, 15 amp circuit breaker, U.L. listed

EME-115103	*3 socket*	**$39.50**
EME-115105	*4 socket*	**$49.50**
EME-115100	*8 socket*	**$54.50**
EME-115110	*9 socket rackmount*	**$74.50**

Single Board Computer

SUPERQUAD - Adv. Micro Digital

Single board, standard size S-100 computer system, 4 MHz Z-80A, single or double density disk controller for 5¼" or 8" drives, 64K RAM, extended addressing, up to 4K of EPROM, 2 serial & 2 parallel I/O ports, real time interrupt clock, CP/M compatible.

CPC-30800A	*A & T*	**$724.95**
IOX-4232A	*Serial I/O adapter*	**$29.95**

Z-80 STARTER KIT - SD Systems

Complete Z-80 microcomputer with RAM, ROM, I/O, keyboard, display, kludge area, manual, & workbook.

CPS-30100K	*Kit with workbook*	**$299.95**
CPS-30100A	*A & T with workbook*	**$469.95**

AIM-65 - Rockwell International

Complete 6502 microcomputer with alphanumeric display, printer, keyboard, & instruction manual.

CPK-50165A	*1K AIM-65*	**$424.95**
CPK-50465A	*4K AIM-65*	**$474.95**
SFK-74600008E	*8K Basic ROM*	**$64.95**
SFK-64600004E	*4K assembler ROM*	**$43.95**
SFK-74600020E	*PL/65 ROM*	**$84.95**
SFK-74600010E	*Forth ROM*	**$64.95**
SFK-74600030E	*Instant Pascal*	**$99.95**
PSX-030A	*Power supply*	**$64.95**
ENX-000002	*Enclosure*	**$54.95**

SPECIAL PACKAGE

4K AIM-65, 8K Basic, power supply, & enclosure

Special Package Price	**$649.95**

S-100 EPROM Boards

PROM-100 - SD Systems

2708, 2716, 2732 EPROM programmer with software.

MEM-99520K	*Kit with software*	**$189.95**
MEM-99520A	*A & T with software*	**$249.95**

PB-1 - SSM Microcomputer

2708, 2716 EPROM board with on-board programmer.

MEM-99510K	*Kit with manual*	**$154.95**
MEM-99510A	*A & T with manual*	**$219.95**

EPROM BOARD - Jade

16K or 32K uses 2708 or 2716 EPROMs, 1K boundary.

MEM-16230K	*Kit w/o EPROMs*	**$79.95**
MEM-16230A	*A & T w/o EPROMs*	**$119.95**

S-100 Video Boards

SPECTRUM COLOR - CompuPro

Full-function color graphics board, up to 8 colors, 256 x 192 graphics, parallel I/O port, 8K RAM.

IOV-1870A	*A & T*	**$348.95**
IOV-1870C	*CSC*	**$398.95**

MICROANGELO - Scion

Ultra-high-resolution 512 x 480, 256 color or black & white S-100 video board

IOV-1500A	*A & T*	**$799.95**

S-100 MotherBoards

ISO-BUS - Jade

Silent, simple, and on sale - a better motherboard

	6 Slot (5¼" x 8⅝")	
MBS-061B	*Bare board*	**$22.95**
MBS-061K	*Kit*	**$39.95**
MBS-061A	*A & T*	**$69.95**
	12 Slot (9¾" x 8⅝")	
MBS-121B	*Bare board*	**$34.95**
MBS-121K	*Kit*	**$69.95**
MBS-121A	*A & T*	**$109.95**
	18 Slot (14½" x 8⅝")	
MBS-181B	*Bare board*	**$54.95**
MBS-181K	*Kit*	**$99.95**
MBS-181A	*A & T*	**$149.95**

ACTIVE TERMINATOR - CompuPro

A true mother's helper.

TSX-100A	*A & T*	**$59.45**

Prices may be slightly higher at our retail locations. Please call the store nearest you for local price and availability.

64K Static RAM $299.95

S-100 CPU Boards

8086/8087 - CompuPro

16 bit, 8 or 10 MHz 8086 CPU with provisions for 8087 & 80130.

CPU-70520A	*8 MHz 8086 A & T*	**$624.95**
CPU-70520C	*8 MHz 8086 CSC*	**$764.95**
CPU-70530A	*with 8087 A & T*	**$1224.95**
CPU-70530C	*with 8087 CSC*	**$1455.95**

8085/8086 - CompuPro

Both 8 & 16 bit CPUs, standard 8 bit S-100 bus, up to 8 MHz, accesses 16 Megabytes of memory.

CPU-20510A	*6 MHz A & T*	**$398.95**
CPU-20510C	*6/8 MHz CSC*	**$497.95**

CPU-Z - CompuPro

2/4 MHz Z80A CPU, 24 bit addressing.

CPU-30500A	*2/4 MHz A & T*	**$279.95**
CPU-30500C	*3/6 MHz CSC*	**$374.95**

SBC-200 - SD Systems

4 MHz Z-80A CPU with serial & parallel I/O, 1K RAM, 8K ROM space, monitor PROM included.

CPC-30200A	*A & T*	**$399.95**

THE BIG Z - Jade

2 or 4 MHz switchable Z-80 CPU board with serial I/O, accomodates 2708, 2716, or 2732 EPROM, baud rates from 75 to 9600.

CPU-30201B	*Bare board w/manual*	**$35.00**
CPU-30201K	*Kit with manual*	**$149.95**
CPU-30210A	*A & T with manual*	**$199.95**

CB-2 - SSM Microcomputer

2 or 4 MHz Z-80 CPU board with provision for up to 8K of ROM or 4K of RAM on board, extended addressing, IEEE S-100, front panel compatible.

CPU-30300K	*Kit with manual*	**$229.95**
CPU-30300A	*A & T with manual*	**$274.95**

2810 Z-80 CPU - C.C.S.

2 or 4 MHZ Z-80 CPU with serial I/O port & on-board monitor PROM, front panel compatible.

CPU-30400A	*A & T with PROM*	**$289.95**

2820 Z-80 DMA CPU - C.C.S.

4 MHz Z-80 CPU board with 2 serial I/O ports & Centronics parallel I/O port, separate data & status ports, DMA daisy chain compatible.

CPU-30420A	*A & T with manual*	**$569.95**

S-100 Disk Controllers

DISK 1 - CompuPro

8" or 5¼" DMA disk controller, single or double density, single or double sided, 10 MHz.

IOD-1810A	*A & T*	**$449.95**
IOD-1810C	*CSC*	**$554.95**
SFC-52506580F	*8" CP/M 2.2 for Z-80*	**$174.95**
SFC-52506586F	*8" CP/M 2.2 for 8086*	**$299.95**
SFO-54158000F	*Oasis single user*	**$499.95**
SFO-54158002F	*Oasis multi-user*	**$849.95**

VERSAFLOPPY II - SD Systems

Double density disk controller for any combination of 5¼" and 8" single or double sided, analog phase-locked loop data separator, vectored interrupts, CP/M 2.2 & Oasis compatible, control/diagnostic software PROM included.

IOD-1160A	*A & T with PROM*	**$359.95**
SFC-55009047F	*CP/M 2.2 with VF II*	**$99.95**

2242 DISK CONTROLLER - C.C.S.

5¼" or 8" double density disk controller with on-board boot loader ROM, free CP/M 2.2 & manual set.

IOD-1300A	*A & T with CP/M 2.2*	**$399.95**

DOUBLE D - Jade

High reliablity double density disk controller with on-board Z-80A, auxiliary printer port, IEEE S-100, can function in multi-user interrupt driven bus.

IOD-1200B	*Bare board & hdwr man*	**$59.95**
IOD-1200K	*Kit w/hdwr & sftwr man*	**$299.95**
IOD-1200A	*A & T w/hdwr & sftwr man*	**$325.95**
SFC-59002001F	*CP/M 2.2 with Double D*	**$99.95**

S-100 Memory Boards

256K RAMDISK - SD Systems

ExpandoRAM III expandable from 64K to 256K using 64K x 1 RAM chips, compatible with CP/M, MP/M, Oasis, Cromemco, & most other Z-80 based systems, functions as ultra-high speed disk drive when used with optional RAMDISK software.

MEM-65064A	*64K A & T*	**$474.95**
MEM-65128A	*128K A & T*	**$574.95**
MEM-65192A	*192K A & T*	**$674.95**
MEM-65256A	*256K A & T*	**$774.95**
SFC-55009000F	*RAMDISK sftwr CP/M 2.2*	**$44.95**
SFC-55009000F	*RAMDISK with EXRAM III*	**$24.95**

128K RAM 21 - CompuPro

128K x 8 bit or 64K x 16 bit static RAM board, 12 MHz, 24 bit addressing.

MEM-12810A	*A & T*	**$1609.95**
MEM-12810C	*CSC*	**$1794.95**

64K RAM 17 - CompuPro

64K CMOS static RAM board, 10 MHz, low power less than 4 watts, DMA compatible, 24 bit addressing.

MEM-64180A	*64K A & T*	**$549.95**
MEM-64180C	*64K CSC*	**$698.95**

64K RAM 16 - CompuPro

32K x 16 bit or 64K x 8 bit low power static RAM board, 10 MHz, 24 bit addressing.

MEM-32180A	*RAM 16 A & T*	**$598.95**
MEM-32180C	*RAM 16 CSC*	**$698.95**

64K STATIC RAM - SSM

IEEE 696/S-100 standard, up to 6MHz/8 Bit, 12MHz/16 Bit, 24 Bit extended addressing, disable-able in 2K increments

MEM-64300A	*A & T*	**$499.95**

64K STATIC RAM - Mem Merchant

64K static S-100 RAM card, 4 to 16K banks up to 8 MHz.

MEM-64400A	*64K A & T*	**$499.95**

64K STATIC RAM - Jade

Uses new 2K x 8 static RAMs, fully supports IEEE 696 24 bit extended addressing, 200ns RAMs, lower 32K or entire board phantomable, 2716 EPROMs may be subbed for RAMs, any 2K segment of upper 8K may be disabled, low power typically less than 500ma.

MEM-99152B	*Bare board*	**$49.95**
MEM-99152K	*Kit less RAM*	**$99.95**
MEM-32152K	*32K kit*	**$199.95**
MEM-56152K	*56K kit*	**$289.95**
MEM-64152K	*64K kit*	**$299.95**
Assembled & Tested		**add $50.00**

2066 64K RAM - C.C.S.

64K RAM board with bank and block select switching functions for Cromemeco Cromix & Alpha Micro.

MEM-64566A	*64K A & T*	**$424.95**

64K EXPANDORAM II - SD Systems

Expandable RAM board from 16K to 64K using 4116 RAM chips.

MEM-16630A	*16K A & T*	**$344.95**
MEM-32631A	*32K A & T*	**$364.95**
MEM-48632A	*48K A & T*	**$384.95**
MEM-64633A	*64K A & T*	**$399.95**

MEMORY BANK - Jade

4 MHz S-100 bank selectable expandable to 64K.

MEM-99730B	*Bare board w/manual*	**$49.95**
MEM-99730K	*Kit with no RAM*	**$179.95**
MEM-32731K	*32K kit*	**$199.95**
MEM-64733K	*64K kit*	**$249.95**
Assembled & Tested		**add $50.00**

16K STATIC RAM - Mem Merchant

4MHz lo-power static RAM board, IEEE S-100, bank selectable, addressable in 4K blocks, disable-able in 1K segments extended addressing.

MEM-16171A	*16K A & T*	**$149.95**

S-100 I/O Boards

SYSTEM SUPPORT 1 - CompuPro

Real time clock, three 16 bit interval timers, dual interrupt controllers(15 levels), up to 4K EPROM/RAM, RS-232C serial channel, provision for 9511A/9512 math chip.

IOX-1850A	*SS1 A & T*	**$359.95**
IOX-1850C	*SS1 CSC*	**$459.95**
IOX-1855A	*with 9511 A & T*	**$554.95**
IOX-1855C	*with 9511 CSC*	**$654.95**
IOX-1860A	*with 9512 A & T*	**$554.95**
IOX-1860C	*with 9512 CSC*	**$654.95**

INTERFACER 1 - CompuPro

2 serial I/O ports 50-19.2K baud.

IOI-1810A	*A & T*	**$218.95**
IOI-1810C	*CSC*	**$288.95**

INTERFACER 2 - CompuPro

3 parallel, 1 serial, & interrupt timer.

IOI-1820A	*A & T*	**$218.95**
IOI-1820C	*CSC*	**$288.95**

INTERFACER 3 - CompuPro

5 or 8 channel serial I/O board for interrupt driven multi-user systems up to 250K baud.

IOI-1835A	*5 port A & T*	**$558.95**
IOI-1835C	*5 port CSC*	**$628.95**
IOI-1838A	*8 port A & T*	**$628.95**
IOI-1838C	*8 port CSC*	**$749.95**

INTERFACER 4 - CompuPro

3 serial, 1 parallel, 1 Centronics parallel.

IOI-1840A	*A & T*	**$314.95**
IOI-1840C	*CSC*	**$414.95**

MPX - CompuPro

Multi-user I/O multiplexer & interrupt controller with on-board 8085A-2 CPU & 4K or 16K of RAM.

IOI-1875A	*4K MPX A & T*	**$444.95**
IOI-1875C	*4K MPX CSC*	**$534.95**
IOI-1880A	*16K MPX A & T*	**$584.95**
IOI-1880C	*16K MPX CSC*	**$674.95**

I/O-8 - SSM Microcomputer

Eight software programmable serial I/O ports, 110 -19.2K Baud, ideal for multi-user systems

IOI-1018A	*A & T*	**$469.95**

I/O-5 - SSM Microcomputer

Two serial & 3 parallel I/O ports, 110-19.2K Baud

IOI-1015A	*A & T*	**$289.95**

MPC-4 - SD Systems

Intelligent 4-port serial I/O card, on-board Z-80A, 2K RAM, 4K PROM area, on-board firmware, fully buffered, vectored interrupts, four CTC channels, add to SD Board set for powerful multi-user system

IOI-1504A	*A & T w/software*	**$495.00**

I/O-4 - SSM Microcomputer

2 serial I/O ports plus 2 parallel I/O ports.

IOI-1010B	*Bare board w/manual*	**$35.00**
IOI-1010K	*Kit with manual*	**$179.95**
IOI-1010A	*A & T with manual*	**$249.95**

2830 6 PORT SERIAL - C.C.S.

Six asynchronous RS-232C serial I/O ports with programmable baud rates.

IOI-1040A	*A & T with manual*	**$529.95**

2710 4 PORT SERIAL - C.C.S.

Four RS-232C serial I/O ports with full handshaking.

IOI-1060A	*A & T with manual*	**$319.95**

2719 2 SER & 2 PAR - C.C.S.

Two RS-232C serial I/O ports plus two 8 bit parallel I/O ports.

IOI-1080A	*A & T with manual*	**$349.95**

Prices may be slightly higher at our retail locations. Please call the store nearest you for local price and availability.

CIRCLE 210 ON READER SERVICE CARD

Parallel Processing For Your Computer?

Edward E. Brent, Jr.

Parallel processing! True parallel processing, according to the *Encyclopedia Of Computer Science*, is the operation of two or more processes at the same time (Ralston and Meek, 1976). How can a microcomputer with a single microprocessor have parallel processing in which two or more processes are being performed at the same time? Like many other microcomputer users, I at first labored under the misconception that my computer had only one processor and hence could not do two things at once. But I was wrong.

Every microcomputer on the market today operates interactively and hence requires two processors to operate: the microprocessor which drives the computer, and an older, somewhat more archaic, often unreliable, but remarkably efficient processor: *the user*.

Admittedly, to speak of parallel processing between the computer and the user is stretching a term which is usually used to refer to processing within the machine. However, if you can keep an open mind and consider the insights this concept of parallel processing might have, perhaps you, too, will find ways it can be useful in your programming.

The need for parallel processing between the computer and the user is made clear by the many programs, including even expensive ones costing hundreds of dollars, which fail to take advantage of parallel processing. Most programs available today have not been written to take advantage of these two processors, probably because most programmers continue to believe that microcomputers have only a single processor. As a result most programs employ *serial processing* in which alternately the computer sits idly by while the user responds to a prompt to enter data, then the user sits idly by while the computer performs what may be lengthy computation or data transfer processes.

Serial processing is used in virtually every kind of programming. It occurs, for example, in many database management programs which have the computer do little, or more likely nothing, while the user is entering data for a record, then force the user to twiddle his thumbs or contemplate his navel or use other more creative techniques to fight off boredom while the program grinds through lengthy search or I/O processes.

Similarly, the spreadsheet business programs such as *Visicalc* do little or no processing while the user is entering data, and then may require the user to wait for minutes at a time while the program performs lengthy computations or writes data to a disk.

So far I have concentrated on those tasks which push the computer to its limit while the user sits impatiently. But to be fair we must admit that we users can be pretty boring too. There are many times when the computer waits patiently for a response from the user, who may be trying to figure out what that variable could be, searching for the correct value in a stack of paper, or off in the kitchen refilling a coffee cup. I can't speak for all users, but most of the time my Apple waits for me at least as often and as long as I wait for it.

For many of these programs, a little more attention to timing might coordinate these operations more effectively so neither the computer nor the user need sit idle any longer than necessary. In addition to reducing the waiting time for both the user and the machine, parallel processing would reduce the overall execution time for programs, permitting the same task to be performed in less time.

In this article I discuss a few fundamental principles which guide attempts to achieve parallel processing. Each of these is illustrated with simple procedures which may be used to take advantage of parallel processing. Then I illustrate the use of these procedures for a few commonly encountered programming tasks which often try the user's patience and bring out the worst in the computer as well. These tasks include user input, disk or printer I/O, and lengthy iterative computations.

After the specific examples are discussed, I discuss several advantages of these procedures, some of their potential disadvantages and limitations, and some possible directions for the future. Let's begin by describing a program which approaches all these tasks using a traditional serial processing program design.

Serial Processing Programs: An Example

Listing 1 is a simple amortization program written in Applesoft Basic for an Apple II+ computer. This program has steps commonly encountered in a wide range of programs. First (lines 100-170), the program prompts the user for information describing himself and a loan to consider. Second (lines 200-360), it performs computations to determine the amortization schedule for the term of that loan. Finally, it saves the resulting information in a file on disk (lines 500-545) and prints a summary of the results for the user on a printer (700-910).

Edward E. Brent, Jr., The Idea Works, Inc., 100 West Briarwood, Columbia, MO 65201.

Hayden's prime...

1. #5534 The BASIC Conversions Handbook for Apple™, TRS-80™, and PET™ Users (Brain Bank) A complete guide to converting Apple II and PET programs to TRS-80, TRS-80 and PET programs to Apple II, and TRS-80 and Apple II programs to PET. Equivalent commands are listed for TRS-80 BASIC (Model 1, Level II), Applesoft BASIC, and PET BASIC, as well as variations for TRS-80 Model III and Apple Integer BASIC. Also describes variations in graphics capabilities. **$8.95**

2. #5106 Basic BASIC: An Introduction to Computer Programming in BASIC Language, 2nd Ed. (Coan) Over 100 sample programs present the essential statements of BASIC. Each new language statement or capability is clearly explained at the time it is first used in a sample program. Every section is followed by practice problems; solutions to even-numbered problems appear in the text and the remainder in the separate Teacher's Guide. **$12.95 Teacher's Guide, #5108, $1.40**

3. #5855 Advanced BASIC: Applications and Problems (Coan) ". . . a useful textbook to the student in a follow-up course, or the programmer acquiring BASIC as his second or third language . . . well above average." *Data Processing Digest.* Advanced techniques and applications, including coordinate geometry, sequences and series, polynomials, graphing, simulations, and games. **$12.75**

Apple is a registered trademark of Apple Computer Company, Inc.; TRS-80 is a registered trademark of Radio Shack, Inc., a division of Tandy Corporation; PET is a registered trademark of Commodore Business Machines; none are affiliated with Hayden Book Company, Inc.

4. #5760 BASIC From the Ground Up (Simon) Explores computers and the BASIC language simply, without requiring the reader to have a heavy mathematical background. Covers one version of each of the BASIC statements and points out variations. Includes exercises and problems, a glossary, and a summary of BASIC statements. **$12.95**

5. #5104 The BASIC Workbook: Creative Techniques for Beginning Programmers (Schoman) An introduction to BASIC using 20 key commands and statements. Students quickly discover how many problems can be solved and how many workable algorithms can be constructed. Students master the fundamentals of BASIC through discovery rather than exposition. **$8.95**

6. #5152 Using Microcomputers in Business: A Guide for the Perplexed (Veit) Essential background briefing for any purchaser of microcomputer systems or software. In a fast-moving style, without the usual buzzwords and technical jargon, Veit answers the most often asked questions. **$10.95**

7. #0761 BASIC Computer Programs in Science and Engineering (Gilder) A collection of 114 ready-to-run BASIC programs for the hobbyist and engineer—programs for performing statistical operations such as means, standard deviations, curve-fitting, and interpolation; programs that design antennas, filters, attenuators, matching networks, plotting, and histograms. All programs have been tested and are fairly universal. **$11.95**

8. #5154 BASIC Computer Programs for the Home (Sternberg) Over 75 practical home application programs useful to the novice or experienced computer owner in increasing the usefulness of any home computer. Each program is documented with a description of its functions and operation, a listing in BASIC, a symbol table, sample data, and sample output. **$11.95**

9./10. BASIC Computer Programs for Business, Vols. 1 & 2 (Sternberg) An invaluable variety of application programs to make your microcomputer pay for itself as soon as it enters your office. Each program is documented with a description of its functions and operation, a listing in BASIC, a symbol table, sample data and sample output.
#5152, VOLUME 1, $12.50
New! #5178, VOLUME 2, $13.95

Hayden

Order Today

Available at your local computer store or order by phone 1-800-631-0856
Dept. #CCD2
In New Jersey
(201) 843-0550 ext. 382

VISA MasterCard

B811

Mail to:

Dept. #CCD2
Hayden Book Company, Inc.
50 Essex Street
Rochelle Park, NJ 07662

Method of payment:
☐ My check or money order is enclosed.
Please charge to my:
☐ Visa ☐ MasterCard
We pay postage and handling.

Residents of NJ and CA add sales tax.

Please send me the item(s) indicated below by code number.

☐ ☐ ☐

If I am not completely satisfied, I may return the book(s) undamaged within 10 days for a complete refund.

Mr./Mrs.
Address Apt. #
City State Zip
Visa/MasterCard # Exp. Date
Signature

Prices subject to change

Parallel Processing, continued...

This program illustrates problems common to many programs which may benefit from parallel processing; problems such as prompting the user for information, performing iterative calculations, saving data to a disk, and printing out a report.

Again, like most programs, this program is designed for serial processing. First the necessary data are obtained; the necessary computations are performed; and finally, the results are saved to disk and printed out. However, if we examine the amount of time spent on each task we see that the first part of the program (the data input) involves a time when the primary task of the computer is to emulate a maid in waiting while the user decides what to enter. Likewise, the last parts of the program are likely to have the user waiting in nervous anticipation while the computer grinds out the calculations, watching helplessly as the disk drive whirrs, or entertaining himself by trying to read the printout as the printer is printing. Thus, during the first part of the program, a machine costing thousands of dollars sits nearly idle, while during the last part, a user who may not tolerate boredom and inefficiency in other settings may be having second thoughts about the joys of microcomputing.

Parallel Processing Program Design

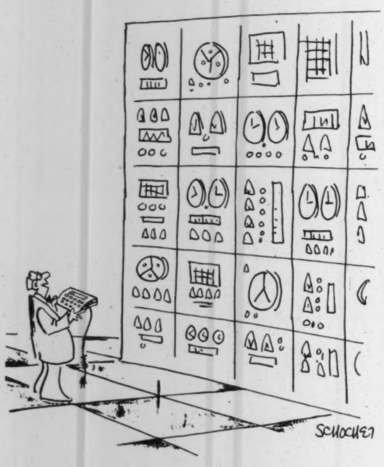
With a few simple changes, the serially organized program in Listing 1 can be redesigned to permit parallel processing by computer and user. There are a few simple principles which may guide attempts to achieve parallel processing in microcomputers.

First Principle: The first, and central principle of parallel processing is to *maximize simultaneous processing*. There are two procedures which maximize simultaneously processing for microcomputers, one for the user and one for the computer.

One way to enable the user to "process" while the computer is at work is to have the computer prompt the user as soon as possible after it has determined the appropriate prompt, then permit the user to consider the alternatives while the program performs whatever other tasks may be done at that time.

Listing 1.

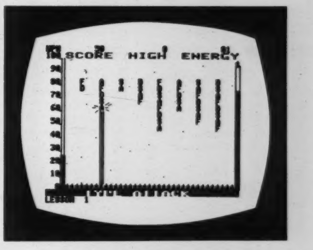
```
10   REM  ************************
11   REM  * AMORTIZATION         *
12   REM  * SCHEDULE PROGRAM     *
13   REM  * USING TRADITIONAL    *
14   REM  * SERIAL PROCESSING    *
15   REM  * DESIGN               *
16   REM  ************************
40   DIM BALANCE(480),I1(480),PRINCIPAL(480),TI(480)
50 NN = 1
100  REM  **********************
110  REM  INPUT DATA SUBROUTINE
120  REM  **********************
130  INPUT "YOUR NAME: ";NAME$
140  PRINT "SOURCE OF LOAN ";NN;: INPUT ": ";SOURCE$
150  INPUT "ANNUAL INTEREST RATE: ";IN
160  INPUT "AMOUNT OF LOAN: ";AMOUNT
170  INPUT "TERM OF LOAN IN YEARS: ";YEARS
200  REM  **********************
210  REM  CALCULATION SUBROUTINE
220  REM  **********************
230 I = IN / 12
240 MO = YEARS * 12
250 A = AMOUNT * I * (I + 1) ^ MO / (((I + 1) ^ MO) - 1)
260  DEF  FN MR(X) = ( INT (100 * (X + .005))) / 100
270 A =  FN MR(A)
280 NL = 0:BALANCE(0) = AMOUNT:TIN(0) = 0
290  FOR PMT = 1 TO MO
300 I1(PMT) =  FN MR(I * BALANCE(PMT - 1))
310 PRINCIPAL(PMT) =  FN MR(A - I1(PMT))
320  IF PMT <  > MO THEN  GOTO 340
330 PRINCIPAL(PMT) = BALANCE(PMT)
340 BALANCE(PMT) =  FN MR(BALANCE(PMT - 1) - PRINCIPAL(PMT))
350 TIN(PMT) =  FN MR(TIN(PMT - 1) + I1(PMT))
360  NEXT PMT
500  REM  ***********************
501  REM  SAVE TO DISK SUBROUTINE
502  REM  ***********************
503  INPUT "WOULD YOU LIKE TO SAVE INFORMATION
       ABOUT THIS LOAN ON DISK? ";IN$
504  IF IN$ <  > "Y" GOTO 700
505 D$ =  CHR$ (4)
510  PRINT D$;"OPEN DATA"
512  PRINT D$;"APPEND DATA"
515  PRINT D$;"WRITE DATA"
520  PRINT NAME$
525  PRINT SOURCE$
530  PRINT IN
535  PRINT AMOUNT
540  PRINT YEARS
545  PRINT D$;"CLOSE DATA"
700  REM  *******************
710  REM  PRINTING SUBROUTINE
720  REM  *******************
730  INPUT "DO YOU WANT TO PRINT OUT AN AMORTIZATIONSCHEDULE? ";IN$
740  IF IN$ <  > "Y" GOTO 1010
750  INPUT "WHICH SLOT IS YOUR PRINTER IN? ";S%
760  PRINT "TURN YOUR PRINTER ON PLEASE"
770 D$ =  CHR$ (4). PRINT D$,"PR#";S%
780  PRINT "MONTHLY PAYMENT = ";A
790  PRINT "PAYMENT"; SPC( 5);"PRINCIPAL"; SPC( 5);"INTEREST"; SPC( 5);
       "BALANCE" ; SPC( 5);"INTEREST TO DATE"
800  FOR PMT = 1 TO MO
810 SS$ = "          "
820 S$(1) =  STR$ (PMT) + SS$
830 S$(2) =  STR$ (PRINCIPAL(PMT)) + SS$
840 S$(3) =  STR$ (I1(PMT)) + SS$
850 S$(4) =  STR$ (BALANCE(PMT)) + SS$
860 S$(5) =  STR$ (TI(PMT)) + SS$
870  FOR MM = 1 TO 5
880 S$(MM) =  LEFT$ (S$(MM),10)
890  NEXT MM
900  PRINT S$(1); TAB( 5);S$(2); TAB( 5);S$(3); TAB( 5);S$(4); TAB( 5);S$(5)
910  NEXT PMT
1000  PRINT D$;"PR#0"
1010  PRINT
1020  INPUT "DO YOU WANT TO CONSIDER ANOTHER LOAN? ";IN$
1030  IF IN$ = "Y" THEN NN = NN + 1: GOTO 140
1040  END
```



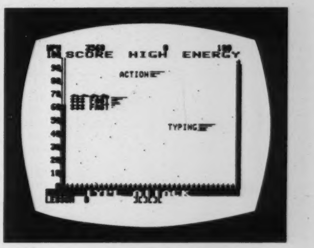
"Guess who's being replaced by advanced technology this time?"

Hero Wanted
To Man
Killer Keyboard

Your country needs you! Strange as it seems, letters and words have begun to attack from the sky. You can stop this assault by typing these belligerent letters on your computer keyboard. The faster you get, the more letters you'll blast down, making this a safer world for all.



CHARACTER ATTACK



WORD ATTACK

Type Attack

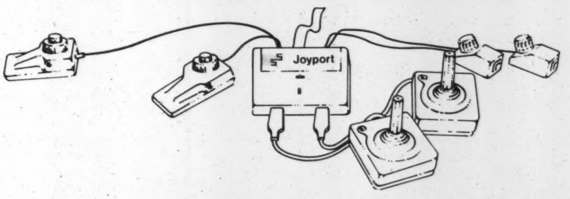
A Fast Action Typing Arcade From Sirius

- Designed by a Professional Educator and Sirius Software.
- A Challenging Game to improve any level of typing skills within hours.
- Colorful Graphics — Amusing Sound Effects — Fast Action
- APPLE, IBM and ATARI versions available.
- A game so enjoyable you'll improve your typing whether you want to or not.
- Chart your progress with unique words-per-minute "speedometer."
- 39 preprogrammed learning games.
- Create up to 60 of your own games.

Type Attack program, packaging and audio visual © 1982. Type Attack and Sirius are trademarks of Sirius Software, Inc. Apple is a trademark of Apple Computer Inc. IBM is a trademark of International Business Machines Corp. Atari is a trademark of Atari Inc. Sirius is not affiliated with Atari Inc.

Sirius Announces

A New JOYPORT Feature



A LOWER PRICE — $49.95

The Sirius Joyport is the most significant input device for the Apple Computer since the keyboard — and NOW IT HAS AN ATTRACTIVE NEW FEATURE: IT'S JUST $49.95!

Other features include:

- Includes a complete user's manual.
- Easily accessible sockets for 4 Apple-compatible game paddles or 2 Apple-compatible joysticks.
- 2 sockets for Atari-type joysticks, the ideal game controller for many games.
- A switch that selects between Apple game paddles or joysticks and Atari-type joysticks with no rewiring required.
- Atari joysticks require a special software driver.
- Joyport is compatible with all new Sirius products and many other popular games from On Line, Datamost, Micro Lab, Gebelli and more.
- Completely compatible with BASIC, Pascal and machine language programs and games.

Sirius and Joyport are trademarks of Sirius Software, Inc. Apple is a trademark of Apple Computer Inc. Atari is a trademark of Atari Inc. Sirius is not affiliated with Atari Inc.

For more information contact your local computer dealer.

Sirius Software, Inc. 10364 Rockingham Drive Sacramento, CA 95827 (916) 366-1195

CIRCLE 312 ON READER SERVICE CARD

THE PRICE SLASHER!

FRANKLIN ACE .... CALL

- Color or Black & White
- Apple II compatible
- 64K of RAM
- Upper and lower case
- Typewriter style keyboard
- 12 key numeric pad
- Alpha lock key
- Visicalc keys
- 50 watt power supply
- Built in fan

ALTOS	
8000-2	CALL
8000-10	CALL
XEROX	
820-11	CALL
COMMODORE	
VIC · 20	$219.

DISK DRIVES

RANA SYSTEMS	
Elite I	$469.
Elite II	CALL
Elite III	CALL
Control Card	109.
MICRO SCI	
A35 w/Controller	444.
A40 w/Controller	479.
A70 w/Controller	629.

PRINTERS

OKIDATA	
Microline 80	CALL
Microline 82A	CALL
Microline 83A	CALL
Microline 84	CALL
Microline 2350 - 350CPS	CALL
BROTHER	
HR-1 Daisy Wheel - Parallel	990.
HR-1 Daisy Wheel - Serial	1050.
Forms Tractor	149.
ANADEX	
DP-9501	1375.
C. ITOH	
Prowriter 8510 AP	499.
Starwriter F10-40PU	1549.
Starwriter F10-RU	1549.
NEC	
8023 w/Tractors	489.
3510 EX	1950.
3515	1950.
7710/7730	2495.
7715	2499.
7720	2699.
7725	2750.
QUME	
9/35 RO	1805.
9/35 KSR	1999.
9/45 LTD	2099.
9/45 FULL	2199.
9/55 LTD	2195.
9/55 FULL	2399.
IDS	
Micro Prism	CALL
Prism 132	CALL
DIABLO	
630, RS-232, Daisy Wheel	$1995.
630 API-Apple, IBM, TRS 80	1775.
620,	1299.
MANNESMANN TALLY PRINTERS	CALL

MONITORS & TERMINALS

TEXAS INSTRUMENTS	
10" color	$349.
SANYO	
12" Black & White	249.
12" Green Screen	265.
13" Color	465.
13" Color RGB	885.
ADDS	
Viewpoint Green Screen	589.
Viewpoint 60	695.
HAZELTINE	
Esprit	585.
Esprit II	649.
BMC USA	
12" Green	95.
12" Hi Res Green	145.
14" Color Composite	329.
14" RGB Color	339.
AMDEK	
12" Green	169.
13" Color I	379.
Color II Hi-Res	849.
Color III RGB Color	475.
TELEVIDEO	
910	639.
912	745.
920	825.
950	989.
NEC	
12" Green Screen	169.
12" Color	389.

ACCESSORIES

SORRENTO VALLEY ASSOCIATES	
App-L-cache 256k Memory	995.
SSM	
AS10 Apple Serial 1 0 Card	129.
AP10 Apple Parrallel 1 0 Card	75.
A10-11	164.
TG PRODUCTS	
Game Paddles	28.
Joy Stick	44.
ORANGE MICRO	
GRAPPLER PLUS	139.
TYMAC	
TYMAC Parallel Board and Cable with Graphics	99.
AMDEK	
DVM Interface Board for Apple II	169.
MPC PERIPHERALS	
Bubble Memory .... NEW	679.
16K Memory Board for Apple II	80.
32K Memory Board for Apple II	149.
Parallel Printer Card for Apple II	72.
Upper and Lower Case ROM	19.
PROM-IT, Eprom for the Apple II	99.
Serial Input/Output Card for Apple II	119.
16/32K Expansion Memory Board	125.
M & R ENTERPRISES	
SUP R TERMINAL 80 Column Video Board	316.
PRACTICAL PERIPHERALS	
Microbuffer II 16K for Apple II	239.
Microbuffer II 32K for Apple II	279.
8K Serial Buffer for Epson Printer	129.
16K Parallel Interface for Epson Printer	129.
MICROSOFT	
Z-80 Softcard for Apple	279.
MOUNTAIN COMPUTER	
CPS Multifunction for Apple	165.
The Clock for Apple	235.
Ramplus	119.
Ramplus 16K for Apple	135.
Ramplus 32K for Apple	152.
Music System for Apple	319.
Rom Writer for Apple	139.
ADVANCE LOGIC	
Z CARD for Apple II	225.
KENSINGTON MICROWARE	
System Saver Fan for Apple	74.
VERSA COMPUTING	
Versawriter Graphics Tablet	299.
SEATTLE COMPUTER	
64K RAM + for the IBM PC	385.
128K RAM + for the IBM PC	529.
256K RAM + for the IBM PC	789.
CALIFORNIA COMPUTER SYSTEMS	
Asynchronous Serial Interface	145.
VIDEX, INC.	
Videoterm	279.
Softvideo Switch	29.
Keyboard Enhancer	99.
Enhancer II	119.

SOFTWARE FOR CP/M

ASHTON-TATE		
dBase II		$499.
MICROPRO		
Wordstar		289.
Mailmerge		129.
Calcstar		189.
Datastar		235.
Supersort		149.
Spellstar		149.
MICROSOFT		
Fortran 80		369.
Macro 80		189.
Basic Compiler		319.
mu/MATH/mu/SIMP 80		219.
Cobol 80		595.
Basic 80		299.
Edit 80		96.
X Macro 80		162.
mu/LISP/mu/STAR 80		162.
Multi Plan		205.
SELECT INFORMATION SYSTEMS		
TIM III Data Base Management System		408.
SOFTWARE DIMENSIONS, INC.		
Accounting Plus		CALL
FOX & GELLER		
Quickscreen		129.
Quickcode		225.
Crosstalk	**MICROSTUF**	139.
Supercalc	**SORCIM**	205.
The Word	**OASIS**	75.
Spellbinder	**LEXISOFT**	249.
T/Maker II	**LIFEBOAT**	219.
Supervyze	**EPIC SOFTWARE**	115.
Condor III	**CONDOR**	799.

*Requires Z80 Card by Microsoft or Z Card by Innovative Software.

Note: Apple is a registered trademark of Apple Computer, Inc. C/PM is a registered trademark of Digital Research.

SOFTWARE FOR IBM

SORCIM		
Supercalc		$205.
SuperWriter		295.
Spellguard		229.
SELECT INFORMATION SYSTEMS		
Select Word Processor W Superspell		369.
VISICORP		
Visicalc 256K Version		189.
Visitrend		239.
Visidex		189.
Visifile		239.
Desktop Plan I		239.
MICROPRO		
Wordstar		289.
Mailmerge		129.
Spellstar		153.
INNOVATIVE SOFTWARE		
TIM III Data Base Management System		408.
I.U.S.		
Easyspeller		139.
Easyfiler		289.
Easywriter II		269.
SOFTWARE DIMENSIONS, INC.		
Accounting Plus		CALL
CONTINENTAL SOFTWARE		
The Home Accountant Plus		119.
DENVER SOFTWARE		
EASy (Executive Accounting System)		535.
Write On	**DATAMOST**	97.
Condor II	**CONDOR**	449.
Crosstalk	**MICROSTUF**	139.
MathMagic	**ISM**	75.
The Tax Manager	**MICROLAB**	175.
d Base II	**ASHTON—TATE**	189.

SOFTWARE FOR APPLE

BRODERBUND		
Serpentine		29.
Choplifter		29.
MICROSOFT		
Typing Tutor II		$18.
Adventure		25.
*Fortran 80		165.
A.L.D.S.		100.
*Basic Compiler		315.
mu/MATH/mu/SIMP 80		200.
Olympic Decathalon		25.
*Cobol 80		595.
M/Sort		156.
TASC Compiler		145.
Softcard Premium System		599.
Time Manager		125.
SELECT INFORMATION SYSTEMS		
Select Word Processor		359.
VISICORP		
CCA Data Management System		79.
Visicalc		189.
Visiterm		79.
Visiplot		159.
Visidex		189.
Visitrend/Visiplot		229.
Visifile		189.
Visischedule		239.
Visipack		549.
Desktop Plan II		189.
MICROPRO		
*Calcstar		129.
*Datastar		179.
*Supersort		139.
*Wordstar		195.
*Mailmerge		129.
*Spellstar		125.
SORCIM		
Spellguard		229.
SOUTHEASTERN SOFTWARE		
Data Capture 4.0		58.
EDU-WARE		CALL
Step by Step (tape)	**PROGRAM DESIGN**	59.
Datafax	**LINK SYSTEMS**	139.
dBase II	**ASHTON-TATE**	499.
Supercalc	**SORCIM**	205.

CALL FOR MORE APPLE SOFTWARE!!

MODEMS

HAYES MICROCOMPUTER PRODUCTS	
Smartmodem	$229.
Smartmodem 1200	599.
Micromodem II	289.
Micromodem 100	325.
Chronograph	225.
NOVATION	
Cat	145.
D-Cat	175.
Auto Cat	225.
Apple Cat II	324.
Apple Cat II—212	CALL

mail
comp

WE ACCEPT: ● MONEY ORDER ● C.O.D. ($300 MAX.)
● PERSONAL CHECK (allow 10 days to clear) ● CASHIERS or CERTIFIED CHECK
● VISA/MASTERCARD (add 2%) ● BANK WIRE TRANSFERS

Add 3% for shipping, handling & insurance ($5 min.) Calif. residents add 6% tax. All equipment is new, comes with manufacturers guarantees, PLUS we guarantee it for 30 days and pay shipping charges on any returns. All equipment subject to price change & availability without notice. Check quantity discounts.

8380 Miramar Road, Suite 200
San Diego, CA 92126
TOLL FREE: 800-752-1341
CALIFORNIA: 619-578-1033

CIRCLE 227 ON READER SERVICE CARD

Similarly, the computer can be permitted to "process" while the user is thinking about the next response by programming it to seek out activities which can be performed while awaiting the next response.

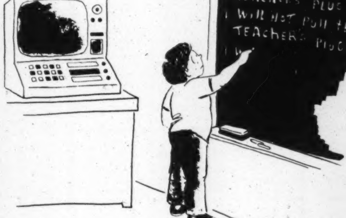
Obviously, these two procedures are related. Hence, parallel processing can be maximized by identifying those segments of the program which take considerable computer time and scheduling them to occur at the same time as other segments requiring considerable user time.

When the user is likely to be slow in responding the computer should take advantage of the situation to perform its own time-consuming tasks. And when the user is likely to be quick in responding or have little or nothing to do, the computer should minimize its own response time by postponing time-consuming tasks.

These procedures are illustrated for the example of the amortization program by a recognized version of this program presented in Listing 2. This version of the program reschedules data input by the user to correspond more closely with those times when the computer is performing time-consuming tasks. During each phase of the program in which the computer is likely to require the longest time to respond, the user can be using that same time to formulate a response to the prompt on the screen.

This program reschedules the data input by the user to ask first for the information required for the computations, Then, while the computer is performing the computations, the program asks the user for additional information. This technique is particularly effective if the second group of user prompts occurring while the program is processing data generally requires the user to take a fair amount of time before responding.

While this version of the input routine should be faster than the serial version


I WILL NOT PULL THE TEACHERS PLUG
I WILL NOT PULL THE TEACHER'S PLUG
Bonet

Listing 2.

```
10  REM  ***********************
11  REM  * AMORTIZATION        *
12  REM  * SCHEDULE PROGRAM    *
13  REM  * USING ELEMENTARY    *
14  REM  * PARALLEL PROCESSING *
15  REM  * DESIGN              *
16  REM  ***********************
40  DIM BALANCE(480),I1(480),PRINCIPAL(480),TI(480)
50 NN = 1:KK = 0
100  REM  *********************
110  REM  INPUT DATA SUBROUTINE
120  REM  *********************
130  INPUT "YOUR NAME: ";NAME$
150  INPUT "ANNUAL INTEREST RATE: ";IN
160  INPUT "AMOUNT OF LOAN: ";AMOUNT
170  INPUT "TERM OF LOAN IN YEARS: ";YEARS
180  PRINT "SOURCE OF LOAN ";NN;": ";
200  REM  **********************
210  REM  CALCULATION SUBROUTINE
220  REM  **********************
230 I = IN / .12
240 MO = YEARS * 12
250 A = AMOUNT * I * (I + 1) ^ MO / (((I + 1) ^ MO) - 1)
260  DEF  FN MR(X) = ( INT (100 * (X + .005))) / 100
270 A =  FN MR(A)
280 NL = 0:BALANCE(0) = AMOUNT:TIN(0) = 0
290  FOR PMT = 1 TO MO
300 I1(PMT) =  FN MR(I * BALANCE(PMT - 1))
310 PRINCIPAL(PMT) =  FN MR(A - I1(PMT))
320  IF PMT <  > MO THEN  GOTO 340
330 PRINCIPAL(PMT) = BALANCE(PMT)
340 BALANCE(PMT) =  FN MR(BALANCE(PMT - 1) - PRINCIPAL(PMT))
350 TIN(PMT) =  FN MR(TIN(PMT - 1) + I1(PMT))
360  NEXT PMT
370  INPUT SOURCE$
500  REM  ***********************
501  REM  SAVE TO DISK SUBROUTINE
502  REM  ***********************
503  INPUT "WOULD YOU LIKE TO SAVE INFORMATION
       ABOUT THIS LOAN ON DISK? ";I N$
504  PRINT "DO YOU WANT TO PRINT OUT AN AMORTIZATIONSCHEDULE? "
505  IF IN$ <  > "Y" GOTO 700
506 D$ =  CHR$ (4)
510  PRINT D$;"OPEN DATA"
512  PRINT D$;"APPEND DATA"
515  PRINT D$;"WRITE DATA"
520  PRINT NAME$
525  PRINT SOURCE$
530  PRINT IN
535  PRINT AMOUNT
540  PRINT YEARS
545  PRINT D$;"CLOSE DATA"
700  REM  ******************
710  REM  PRINTING SUBROUTINE
720  REM  ******************
730  INPUT IN$
740  IF IN$ <  > "Y" THEN KK = 1: GOTO 1010
750  INPUT "WHICH SLOT IS YOUR PRINTER IN? ";S%
760  PRINT "TURN YOUR PRINTER ON PLEASE"
761  PRINT
762  PRINT "DO YOU WANT TO CONSIDER ANOTHER LOAN? "
770 D$ =  CHR$ (4): PRINT D$;"PR#";S%
780  PRINT "MONTHLY PAYMENT = ";A
790  PRINT "PAYMENT"; SPC( 5);"PRINCIPAL"; SPC( 5);"INTEREST"; SPC( 5);
       "BALANCE" ; SPC( 5);"INTEREST TO DATE"
800  FOR PMT = 1 TO MO
810 SS$ = "          "
820 S$(1) =  STR$ (PMT) + SS$
830 S$(2) =  STR$ (PRINCIPAL(PMT)) + SS$
840 S$(3) =  STR$ (I1(PMT)) + SS$
850 S$(4) =  STR$ (BALANCE(PMT)) + SS$
860 S$(5) =  STR$ (TI(PMT)) + SS$
870  FOR MM = 1 TO 5
880 S$(MM) =  LEFT$ (S$(MM),10)
890  NEXT MM
900  PRINT S$(1); TAB( 5);S$(2); TAB( 5);S$(3); TAB( 5);S$(4); TAB( 5);S$(5)
910  NEXT PMT
1000  PRINT D$;"PR#0"
1010  PRINT
1011  IF KK = 1 THEN  PRINT "DO YOU WANT TO CONSIDER ANOTHER LOAN? "
1015 KK = 0
1020  INPUT IN$
1030  IF IN$ = "Y" THEN NN = NN + 1: GOTO 150
1040  END
```

DYNACOMP

Quality software for:*

APPLE II Plus
OSBORNE-1
NORTH STAR***
ATARI
PET/CBM
ALTAIR****
NEC PC-8000
TRS-80 (Level II)**
SUPERBRAIN*****
CP/M Disks/Diskettes
(See Availability box MBASIC/CBASIC)

CARD GAMES

NEW

BRIDGE MASTER (Available for all computers) Price: $21.95 Diskette
If you liked DYNACOMP'S BRIDGE 2.0, you will absolutely love BRIDGE MASTER. BRIDGE MASTER is a comprehensive bridge program designed to provide hours of challenging competition. Bidding features include the Blackwood convention, Stayman convention, pre-emptive openings, and recognition of demand bids and jump-shift responses. After playing a specific hand, you may replay the same hand, with the option of switching cards with your computer opponents. This feature allows you to compare your bidding and playing skills to BRIDGE MASTER. Bonuses for game contracts and slams are awarded as in duplicate bridge. Doubled contracts are scored based upon a computer assigned vulnerability. A score card is displayed at the conclusion of each hand. The score card displays a summary of total hands played, total points scored, number of contracts made and set, and % bids made. BRIDGE MASTER is clearly the best computer bridge program available.
DYNACOMP'S previous BRIDGE 2.0 customers may upgrade to BRIDGEMASTER for a nominal charge of $5.00 plus postage and handling (see ordering information box). Original cassette/diskette must be returned.

BACCARAT (Atari only) Price: $18.95 Cassette/$22.95 Diskette
This is the European card game which is the favorite of the Monte Carlo jet set. Imagine yourself at the gaming table with 007 to your left and Goldfinger to your right. Learn and play BACCARAT at your leisure on the Atari. Contains full high resolution color graphics and matching sound. Runs in 16K. Requires one joystick.

GIN RUMMY (Apple diskette only) Price: $22.95 Diskette
This is the best micro computer implementation of GIN RUMMY existing. The computer plays exceptionally well, and the HIRES graphics are superb. What else can be said?

POKER PARTY (Available for all computers) Price: $19.95 Cassette/$23.95 Diskette
POKER PARTY is a draw poker simulation based on the book, POKER, by Oswald Jacoby. This is the most comprehensive version available for microcomputers. The party consists of yourself and six other (computer) players. Each of these players (you will get to know them) has a different personality in the form of a varying propensity to bluff or fold under pressure. Practice with POKER PARTY before going to that expensive game tonight! Apple cassette and diskette versions require a 32K (or larger) Apple II.

GO FISH (Available for all computers) Price: $14.95 Cassette/$18.95 Diskette
GO FISH is a classic children's card game. The opponent is a friendly computer with user inputs that are simple enough for small children to easily master. The Apple and Atari versions employ high resolution graphics for the display of hands. A must for children! Runs in 16K.

NEW

BLACKJACK COACH (32K TRS-80 only) Price: $29.95 Cassette/$33.95 Diskette
BLACKJACK COACH teaches and evaluates professional playing methods. This program will coach you using the Basic and the Complete Card Counting Methods. The BLACKJACK COACH can be used in automatic, unattended play to test the playing and betting strategies you select. Extensive summary reports pinpoint the strengths and weaknesses of various methods of play. All the standard player choices are included: Insurance, splitting pairs, double downs and surrender (optional). A line printer may be used to collect data. If you risk money at the tables, increase your skills with the BLACKJACK COACH!

THOUGHT PROVOKERS

MANAGEMENT SIMULATOR (Available for all computers) Price: $25.95 Cassette/$29.95 Diskette
This program is both an excellent teaching tool as well as a stimulating intellectual game. Based upon similar games played at graduate business schools, each player or team controls a company which manufacturers three products. Each player attempts to outperform his competitors by setting selling prices, production volumes, marketing and design expenditures etc. The most successful firm is the one with the highest stock price when the simulation ends.

FLIGHT SIMULATOR (Available for all computers) Price: $19.95/Cassette/$23.95 Diskette
A realistic and extensive mathematical simulation of take-off, flight and landing. The program utilizes aerodynamic equations and the characteristics of a real airfoil. You can practice instrument approaches and navigation using radials and compass headings. The more advanced flyer can also perform loops, half-rolls and similar aerobatic maneuvers. Although this program does not employ graphics, it is exciting and very addictive. See the software review in COMPUTRONICS. Runs in 16K Atari.

VALDEZ (Available for all computers) Price: $17.95 Cassette/$21.95 Diskette
VALDEZ is a computer simulation of supertanker navigation in the Prince William Sound/Valdez Narrows region of Alaska. Included in this simulation is a realistic and extensive 256 x 256 element map, portions of which may be viewed using the ship's alphanumeric radar display. The motion of the ship itself is accurately modelled mathematically. The simulation also contains a model for the tidal patterns in the region, as well as other traffic (outgoing tankers and drifting icebergs). Chart your course from the Gulf of Alaska to Valdez Harbor! See the software reviews in 80 Software Critique, Personal Computing and Creative Computing.

BACKGAMMON 2.0 (Available for all computers) Price: $19.95 Cassette/$23.95 Diskette
This program tests your backgammon skills and will also improve your game. A human can compete against a computer or against another human. The computer can even play against itself. Either the human or the computer can double or generate dice rolls. Board positions can be created or saved for replay. BACKGAMMON 2.0 plays in accordance with the official rules of backgammon and is sure to provide many fascinating sessions of backgammon play.

NEW

FROG MASTER (Atari only) Price: $17.95 Cassette/$21.95 Diskette
The Atari APEX first prize winner. FROG MASTER contains exciting arcade features in addition to being a highly educational program. It is a fast-moving high-concentration game for 1-4 players. You score by making touchdowns on the opponents' goal line – if his goalie doesn't get there first. But your players (tadpoles and frogs) must be trained. This is accomplished by giving them a reward at just the right moment when they do something right. This takes precise timing and judgement. Your critters must penetrate barriers and avoid evil line backs if they are to score. Many will fall by the wayside, but some will get through. As they learn you can look inside their heads to see how they think. As you reward them, they reward you (the "thought processes" simulated demonstrate the basic type of animal learning - operant conditioning - widely studied in high school and college courses). As you teach them they teach you how learning takes place! Great graphics! Runs in 16K. Requires two joysticks.

FOREST FIRE! (Atari only) Price: $14.95 Cassette/$18.95 Diskette
Using excellent graphics and sound effects, this simulation puts you in the middle of a forest fire. Your job is to direct operations to put out the fire while compensating for changes in wind, weather and terrain. Not protecting valuable structures can result in startling penalities. Life-like variables are provided to make FOREST FIRE! very suspenseful and challenging. No two games have the same setting and there are 3 levels of difficulty.

CRANSTON MANOR ADVENTURE (North Star, SuperBrain and CP/M only) Price: $19.95 Diskette
At last! A comprehensive Adventure game for North Star and CP/M systems. CRANSTON MANOR ADVENTURE takes you into mysterious CRANSTON MANOR where you attempt to gather fabulous treasures. Lurking in the manor are wild animals and robots who will not give up the treasures without a fight. The number of rooms is greater and the associated descriptions are much more elaborate than the current popular series of Adventure programs, making this game the top in its class. Play can be stopped at any time and the status stored on diskette.

SPACE EVACUATION! (Available for all computers) Price: $15.95 Cassette/$19.95 Diskette
Can you colonize the galaxy and evacuate the Earth before the sun explodes? Your computer becomes the ship's computer as you explore the universe to relocate millions of people. This simulation is particularly interesting as it combines many of the exciting elements of classic space games with the mystery challenge of ADVENTURE.

MONARCH (Atari only) Price: $14.95 Cassette/$18.95 Diskette
MONARCH is a fascinating economic simulation requiring you to survive an 8-year term as your nation's leader. You determine the amount of acreage devoted to industrial and agricultural use, how much food to distribute to the populace and how much should be spent on pollution control. You will find that all decisions involve a compromise and that it is not easy to make everyone happy. Runs in 16K Atari.

NEW

RUBIK'S CUBE SOLVER (Available for all computers) Price: $14.95 Cassette/$18.95 Diskette/$21.45 Disk
Solving the Rubik's cube puzzle is an exercise in algorithimic logic, and is a "natural" for computer calculation. The RUBIK'S CUBE SOLVER permits you to input the starting state of the 24 facing elements of the cube. It then solves the problem one step at a time, with each step shown as a unfolded view of the cube. Can you solve the cube in fewer steps. In any case, it sure beats disassembling the cube or peeling off and replacing the colors! Requires 16K.

AVAILABILITY

DYNACOMP software is supplied with complete documentation containing clear explanations and examples. Unless otherwise specified, all programs will run within 16K program memory space (ATARI requires 24K). Except where noted, programs are available on ATARI, PET, TRS-80 (Level II), NEC and Apple (Applesoft) cassette and diskette as well as North Star single density (double density compatible) diskette. Additionally, most programs can be obtained on standard (IBM 3740 single density/double density compatible format) 8" CP/M floppy disks for systems running under MBASIC or CBASIC (for example, Altos, Xerox 820, Heath/Zenith and many others). 5¼" CP/M diskettes are available for the North Star, SuperBrain and Osborne computer systems.

**ATARI, PET CBM, NORTH STAR, CP M, IBM, OSBORNE, SUPERBRAIN, NEC PC-8000 and XEROX are registered tradenames and or trademarks.*
***Except where noted, all TRS-80 Model I software is available on cassette (only) for the TRS-80 Model III. Exceptions: VALDEZ, CRIBBAGE, GRAFIX, CHESSMASTER. TRS-80 diskettes are not supplied with either DOS or BASIC.*
****For most North Star disk-based systems.*
*****For Altair systems having Microsoft BASIC.*
******For SUBERBRAIN systems running under MBASIC or CBASIC (state which).*

DYNACOMP OFFERS THE FOLLOWING

- Widest variety
- Guaranteed quality
- Fastest delivery
- Friendly service
- Free catalog*
- Toll free order phone

*$2.00 U.S. funds for foreign mailing.

AND MORE...

STARBASE 3.2 (Available for all computers) Price: $13.95 Cassette/$17.95 Diskette
This is the classic space simulation, but with several new features. For example, the Croylins now shoot at the Invincible without warning while also attacking starbases in other quadrants. The Croylins also attack with both light and heavy cruisers and move when shot at! The situation is hectic when the Invincible is besieged by three heavy cruisers and a starbase S.O.S. is received! The Croylins get even! See the software reviews in A.N.A.L.O.G., 80 Software Critique and Game Merchandising.

LIL' MEN FROM MARS (Atari only) Price: $19.95 Cassette/$23.95 Diskette
Defend yourself! The little men from Mars are out to get you if you don't get them first. This is a hilarious high resolution animated graphics (arcade) game which exercises much of the Atari's power. Requires one joystick.

NEW

ALVIN (Atari only) Price: $17.95 Cassette/$21.95 Diskette
ALVIN is a great arcade game. You are commanding a highly maneuverable ship seeking to destroy several enemy cities. You are attempting to bomb these cities while at the same time trying to avoid their defensive fire (MISSILE COMMAND™ in reverse?). Also, your radar has been damaged so that you can only see downwards. This would normally not be much of a problem except that you also have to contend with high-flying enemy aircraft. As long as you are above these aircraft you have the advantage and are safe. However, high level bombing takes considerable skill. Therefore to achieve your goal the best strategy is to swoop down for a bombing run while the enemy craft is out of range, and quickly retreat to the skies. A fun game. Requires 16K.

ESCAPE FROM VOLANTIUM (Atari only) Price: $15.95 Cassette/$19.95 Diskette
Bring the action and excitement of an arcade into your home with ESCAPE FROM VOLANTIUM! To escape you must maneuver your space ship around obstacles and laser blast the guardian (without being eaten). If he is killed with a direct shot (not just a leg lopped off), a door opens to the outside. However, the door does not stay open indefinitely. If you fail to escape in time, the door closes and a new guardian appears. Sometimes you can smash through the door by repeatedly chipping away at it. Other times it is impervious. At the higher levels of play more obstacles and guardians appear, adding to the excitement. Uses high resolution graphics and sound. Runs in 16K.

ALPHA FIGHTER (Atari only) Price: $13.95 Cassette/$17.95 Diskette
Two excellent graphics and action programs in one! ALPHA FIGHTER requires you to destroy the alien starships passing through your sector of the galaxy. ALPHA BASE is in the path of an alien UFO invasion; let five UFO's get by and the game ends. Both games require the joystick and get progressively more difficult the higher you score! ALPHA FIGHTER will run on 16K systems.

THE RINGS OF THE EMPIRE (Atari only) Price: $14.95 Cassette/$18.95 Diskette
The empire has developed a new battle station protected by rotating rings of energy. Each time you blast through the rings and destroy the station, the empire develops a new station with more protective rings. This exciting game runs on 16K systems, employs extensive graphics and sound and can be played by one or two players.

INTRUDER ALERT (Atari only) Price: $15.95 Cassette/$19.95 Diskette
This is a fast paced graphics game which places you in the middle of the "Dreadstar" having just stolen its plans. The droids have been alerted and are directed to destroy you at all costs. You must find and enter your ship to escape with the plans. Five levels of difficulty are provided. INTRUDER ALERT requires a joystick and will run on 16K systems.

MIDWAY (Atari 32K only) Price: $14.95 Cassette/$18.95 Diskette
MIDWAY is an exciting extension of the game of Battleship. It mixes the challenges of strategy and chance. Your opponent can be another human or the computer. Color graphics and sound are both included. Runs in 16K.

NEW

GOLF PRO (Atari only) Price: $17.95 Cassette/$21.95 Diskette
Both realism and beautiful graphics are joined together in GOLF PRO to produce the best golf simulation available. To really appreciate this game, you should have a color TV so that you can see the green of the fairway, the blue of the water hazards, and the white sand of the traps. You tee off with a wood, use your wedge in the sand trap, and putt on the green just as would be done on the course. Show off the Atari to your friends with GOLF PRO. Requires 16K and one joystick.

GAMES PACK I (Available for all computers) Price: $14.95 Cassette/$18.95 Diskette
GAMES PACK I contains the classic computer games of BLACKJACK, LUNAR LANDER, CRAPS, HORSERACE, SWITCH and more. These games have been combined into one large program for ease in loading. They are individually accessed by a convenient menu. This collection is worth the price just for the DYNACOMP version of BLACKJACK.

GAMES PACK II (Available for all computers) Price: $14.95 Cassette/$18.95 Diskette
GAMES PACK II includes the games CRAZY EIGHTS, JOTTO, ACEY-DUCEY, LIFE, WUMPUS and others. As with GAMES PACK I, all the games are loaded as one program and are called from a menu. You will particularly enjoy DYNACOMP's version of CRAZY EIGHTS.
Why pay $9.95 or more per program when you can buy a DYNACOMP collection for just $14.95?

MOON PROBE (Available for all computers) Price: $12.95 Cassette/$16.95 Diskette
This is an extremely challenging "lunar lander" program. The user must drop from orbit to land at a predetermined target on the moon's surface. You control the thrust and orientation of your craft plus direct the rate of descent and approach angle. Runs in 16K Atari.

SPACE TRAP (Atari only, 16K) Price: $14.95 Cassette/$18.95 Diskette
This galactic "shoot 'em up" arcade game places you near a black hole. You control your spacecraft using the joystick and attempt to blast as many of the alien ships as possible before the black hole closes about you.

SUPER SUB CHASE (Atari only) Price: $19.95 Cassette/$23.95 Diskette
SUPER SUB CHASE simulates a search and destroy mission. Set your course and keep an eye on the sonar readings as you hunt for the hidden submarine. Set the depth charge explosion depth and watch them sink towards the sub. This is an addictive game which takes advantage of the Atari's graphics and sound capabilities. One or two players. Joystick(s) required.

TWO PLAYER GAMES

NEW

TWO PLAYER GAMES (Available for all computers; 32K disk/diskette only)
DYNACOMP has acquired the distribution rights to the best eight of Xitron's wargames. These two-player games were originally written for the North Star computer, but have since been converted to play on all of the computers currently supported by DYNACOMP. Because our licensing and development costs were so low, DYNACOMP offers these programs two to a disk(ette) for only $19.95/diskette, $23.95/disk. If you like war games, then this is a bargain you can not pass up.

Set #1: **PANZER and BLITZKRIEG**
PANZER
Date: 23 Nov. 1943 Place: Several miles west of Kiev, Russia. The Russians have just liberated Kiev and are moving quickly to reach the German forces which are preparing for a last desperate attempt to halt the Russian advance.
BLITZKRIEG
Date: Spring 1940 Place: Northern France. The German blitzkrieg in the east was complete. Germany had turned its attention to the west: France. The German forces has penetrated the Ardennes and Meuse. The heroism of Dunkirk, the defense of the Aisne-Somme position, and the final collapse of the French armies in the south has all passed. And, now, the drive on Paris . . .

Set #2: **STARSHIP TROOPERS and INVASION OF THE MUD PEOPLE**
STARSHIP TROOPERS
Date: Fortieth Century Place: Arachnid planet of Sheol. The first all-out battle on the planet Sheol which will match equal forces of Terran and alien units. The outcome will set the course of the conflict, for the planet of Sheol is a key position in the solar war.
INVASION OF THE MUD PEOPLE
A Peruvian army battalion has been dispatched to a remote village area to investigate the destruction of many local dwellings and the disappearance of most of the villagers. Eye-witnesses have reported strange creatures appearing from scores of slimy mud holes which have oddly begun forming across the terrain.

Set #3: **FALL OF THE THIRD REICH and ARMORCAR**
FALL OF THE THIRD REICH
Date: March, 1945 Place: Remagen, Germany. The allies under General Eisenhower had reached the Rhine. The Germans had failed in destroying the Ludendorff railroad bridge, allowing several allied divisions to cross before it finally collapsed on March 17 ... and so, the allies began their drive on Berlin.
ARMORCAR
Date: 2 Feb. 1944 Place: Minsk, Russia. A German front-line unit is hard pressed for radio equipment and medical supplies. A relief convoy of armored cars must reach them through partisan-infested territory.

Set #4: **MOUNT SURIBACHI and MIDDLE EARTH**
MOUNT SURIBACHI
Date: 16 Feb. 1945 Place: Iwo Jima. The Japanese opened fire from Mount Suribachi as the marines landed on the porkchop-shaped island. Gunfire from the hill could cover the entire island, thus it was a critical objective if the Americans were to capture and utilize the all-important air field. Mount Suribachi proved to be one of the most strongly defended positions in the Japanese theatre of war.
MIDDLE EARTH
Date: 1997 Place: MIDDLE EARTH. Through a maze of tunnels, crevices, and rocky passageways discovered leading from an inactive volcano in South America, a team of United Nations' researchers have undertaken a mission to an uncharted frontier: the center of the Earth. After a perilous journey spanning a period of several months, the mission has arrived at the Earth's core, a land of flames, steam, oceans, and unforeseen vegetation. And then the creatures of MIDDLE EARTH appeared . . . unmatched by the most frightening horror stories created by man . . .

MISCELLANEOUS

CRYSTALS (Atari only) Price: $14.95 Cassette/$18.95 Diskette
A unique algorithm randomly produces fascinating graphics displays accompanied with tones which vary as the patterns are built. No two patterns are the same, and the combined effect of the sound and graphics are mesmerizing. CRYSTALS has been used in local stores to demonstrate the sound and color features of the Atari. Runs in 16K.

NORTH STAR SOFTWARE EXCHANGE (NSSE) LIBRARY
DYNACOMP now distributes the 23 volume NSSE library. These diskettes each contain many programs and offer an outstanding value for the purchase price. They should be part of every North Star user's collection. Call or write DYNACOMP for details regarding the contents of the NSSE collection.
Price: $9.95 each/$8.95 each (4 or more)
The complete collection may be purchased for $159.95.

NEW

5¼" DISKETTES (soft sectored/ten sectored) Price: $39.95/20 Diskettes
As you might imagine, DYNACOMP purchases diskettes in large quantities and at wholesale prices. We want to pass the savings along to you!

BUSINESS and UTILITIES

NEW **PORTFOLIO MANAGEMENT** (Apple only) Price: $69.95 two Diskettes
The PORTFOLIO MANAGEMENT package was written by a stock broker to help manage portfolios for individual customers. With this program data files can be easily created and kept up to date. A variety of reports can be generated for clients which are attractively and professionally laid out. The user may define his/her own investment catagories. PORTFOLIO MANAGEMENT is a top quality, professional tool which will not only provide you with new conveniences but will also serve to enhance your appearance as an efficient and up to date advisor to your clients. Comes complete on two diskettes along with a 30 page instruction manual.

NEW **PERSONAL FINANCE SYSTEM** (Available for all computers) Price: $39.95 Diskette
PFS is a single diskette, menu-oriented system composed of ten different programs. Besides recording your expenses and tax deductible items, PFS will sort and summarize expenses by payee, and display information on expenditures by any of 26 user defined codes by month or by payee. PFS will even produce monthly bar graphs of your expenses by category! This powerful package requires only one disk drive, minimal memory (24K Atari, 32K North Star) and will store up to 600 records per disk (and over 1000 records per disk by making a few simple changes to the programs). You can record checks plus cash expenses so that you can finally see where your money goes and eliminate guesswork and tedious hand calculations. Contains high speed machine language sort. PFS has been demonstrated on network (CBS) TV!

FAMILY BUDGET (Apple and Atari only) Price: $34.95 Diskette
FAMILY BUDGET is a very convenient financial record-keeping program. You will be able to keep track of cash and credit expenditures as well as income on a daily basis. You can record tax deductible items and charitable donations. FAMILY BUDGET also provides a continuous record of all credit transactions. You can make daily cash and charge entries to any of 21 different expense accounts as well as to 5 payroll and tax accounts. Data are easily retrieved giving the user complete control over an otherwise complicated (and unorganized!) subject.

NEW **TEXT MASTER** (Apple 32K, diskette only) Price: $49.95 Diskette
TEXT MASTER is a general purpose text editor for the Apple II computer. It features powerful, English-oriented commands which permit the complete manipulation of textural information. The information treated may be correspondence, computer programs, data to be used by other programs, and more. TEXT MASTER also interfaces with any printer connected to your Apple. The minimum system requirements are 32K of RAM, Applesoft on ROM, at least one disk, and a lower case adapter. TEXT MASTER can process any length file segment by segment. Thus it is possible to process files as large as a diskette. Comes complete with an efficient 16 page manual. TEXT MASTER is equivalent in capability to many word processing systems costing 3 x or more in price. The commands available in TEXT MASTER are: COLLECT, USE, EXECUTE, NONUM, INSERT, MERGE, STOP, RENUM, DELETE, SAVE, COPY, FREE, REPLACE, WAIT, MOVE, LENGTH, LIST, RESAVE, CLEAR, AUTO, RETRY, APPEND, SET, MANUAL, CHANGE, SCRATCH, SHOW, CATALOG, MODIFY, COMPARE, NUM, DISPLAY, HELP.

INTELINK (Atari only) Price: $49.95 Diskette
This software package contains a menu-driven collection of programs for facilitating efficient two-way communications through a full duplex modem (required for use). In one mode of operation you may connect to a data service (e.g., The SOURCE or MicroNet) and quickly load data such as stock quotations onto your diskette for later viewing. This greatly reduces "connect time" and thus the service charge. You may also record the complete contents of a communications session. Additionally, programs written in BASIC, FORTRAN, etc. may be built off-line using the support text editor and later "uploaded" to another computer, making the Atari a *very* smart terminal. Even Atari BASIC programs may be uploaded. Further, a command file may be built off-line and used later as controlling input for a time-share system. That is, you can set up your sequence of time-share commands and programs, and the Atari will transmit them as needed: batch processing. All this adds up to saving both connect time and your time.

NEW **PAYFIVE** (Apple II plus diskette, two drives required) Price: $149.95
This is an enormously flexible employee payroll system with extraordinarily good human engineering features. PAYFIVE prints checks and compiles the required federal, state and local forms for up to 148 employees. The pay methods may be hourly, salary, commission or any combination. There are multiple options for pay periods, and they also can be used in any combination. PAYFIVE includes *many* other features and comes extremely well documented with a 200 page manual. The manual may be purchased separately for $30, and that payment later applied to the software purchase.

SHOPPING LIST (Atari only) Price: $12.95 Cassette/$16.95 Diskette
SHOPPING LIST stores information on items you purchase at the supermarket. Before going shopping, it will remind you of all the things you might need, and then display (or optionally print) your shopping list and the total cost. Adding, deleting, changing and storing data is very easy. Runs with 16K.

NEW **TAX OPTIMIZER** (Available for all computers) Price: $59.95 Diskette
The TAX OPTIMIZER is an easy-to-use, menu-oriented software package which provides a convenient means for analyzing various income tax strategies. The program is designed to provide a quick and easy data entry. Income tax is computed by all tax methods (regular, income averaging, maximum and alternate minimum tax). The user may immediately observe the tax effect of critical financial decisions. TAX OPTIMIZER has been thoroughly field tested in CPA offices and comes complete with the current tax tables in its data files. TAX OPTIMIZER is tax deductible!

STOCK MASTER/STOCK PLOT (Apple 48K) Price: $59.95 Diskette
This is a full-featured stock portfolio management and analysis system. Ten years of records on up to thirty stocks may be maintained. You may record prices, revenue, earnings/share, ROE, quarterly earnings and dividends, transactions, long/short term gains, P/E, indexes (DJ, S & P, NASDAQ) and MORE! You may plot (HIRES) the price history of any stock against any other, time, or the indexes. Portfolio value may be evaluated at any time. Comes complete with superbly written instructions and sample files on a second diskette.

TURNKEY AND MENU (Atari only) Price: $17.95 Diskette
TURNKEY is a utility program which allows you to create autoboot/autorun diskettes easily. Simply load and run TURNKEY, load the program diskette to be modified, and answer the questions! The TURNKEY diskette also comes with DOS 2.0 and includes another program, MENU. MENU lists the contents of your diskette alphabetically, and permits the running of any BASIC program on the diskette by typing a single key. TURNKEY and MENU provide you with the ability to run any program on your diskette by simply turning on the computer and pressing a single key.

STOCKAID (Atari only) Price: $29.95 Diskette
STOCKAID provides a powerful set of tools for stock market analysis. With STOCKAID you can display point and figure charts, as well as bar charts with oscillators. You can also examine long-term moving averages and on-balance volume features. STOCKAID allows you to input daily data with a single diskette storage capability of 239 days x 16 stocks. Included are stock dividend and split adjustment capabilities. A very professional package!

NEW **NYINDEX** (Atari only) Price: $29.95 Diskette
NYINDEX is a comprehensive software package for storing, retrieving and plotting New York Stock Exchange information. The daily data treated includes the composite index, advances, declines, new highs and new lows. Graphical displays include the above plus the index oscillator, cumulative advances/declines and moving averages. Data entry and editing is easy. The diskette includes more than two years of daily data. NYINDEX is an excellent companion to STOCKAID.

PLAYER-MISSILE GRAPHICS TABLET (Atari only) Price: $19.95 Diskette
The PLAYER-MISSILE GRAPHICS TABLET was designed to take the drudgery out of developing four color displays in GRAPHICS MODE 7. No longer will you have to read the locations of those tiny blocks on your graph paper and calculate PLOTs and DRAWTOs. With PMG you will be able to easily design colorful graphic displays with your joystick and save them on diskette for later recall.

LIFE CYCLE ANALYSIS AND DEPRECIATION (Apple diskette only) Price: $39.95 Diskette
This software package creates a data file of business expenses for equipment which can later be used to calculate and display a variety of reports. You may project annual costs, find the present worth, create depreciation schedules and justify tax deductions. The evaluation techniques conform to standards set by federal agencies. This is an invaluable package for any businessman who has invested in equipment. LIFE CYCLE ANALYSIS features an easy to use data file creation section and provides formatted hardcopy reports for use in presentations or for tax record keeping purposes. When used for generating tax information, this package is tax deductible! Requires 48K. Comes on two diskettes.

NEW **MICROMAGIC** (Apple diskette only) Price: $39.95 Diskette
The emphasis of this program is clearly the MAGIC! MICROMAGIC offers outstanding versatility in its ability to function as a stand alone entertainment package or as a utility program to create stunning *animated* graphics for use in other programs. The secret lies in MICROMAGIC's special on screen graphics editor. You control a graphics cursor directly from the keyboard, creating high resolution images using all 16 available colors. When you are done with a picture, it can be saved on disk with a single key command. Up to 24 images can be saved as "frames" of a movie, and then played back at high speed to creat short animated sequences. The effects are truly stunning.

This package comes complete with demonstration programs so that even novice users can get immediate results. No programming skills are necessary to use MICROMAGIC. If you have been frustrated by the effort required to create graphics images with your computer, MICROMAGIC will delight you.

SHAPE MAGICIAN (Apple II, 48K, diskette only) Price: $29.95
At last! An utility for painlessly creating graphics shapes for the Apple. Create, edit and save up to 30 shapes which can then be used to develop arcade games or to simply enhance your programs. Add that professional touch!

ORDERING INFORMATION

All orders are processed and shipped within 48 hours. Please enclose payment with order and include the appropriate computer information. If paying by VISA or Master Card, include all numbers on card. Purchase orders accepted.

Shipping and Handling Charges
Within North America: Add $2.00
Outside North America: Add 15% (Air Mail)

Delivery
All orders (excluding books) are sent First Class.

Quantity Discounts
Deduct 10% when ordering 3 or more programs; 20% when ordering 5 or more. Dealer discount schedules available upon request.

8" CP/M Disks
Add $2.50 to the listed diskette price for each 8" floppy disk (IBM soft sectored CP/M format). Programs run under Microsoft MBASIC or BASIC-80.

5¼" CP/M Disks
All software available on 8" CP/M disks is also available on 5¼" disks, North Star, Osborne, Superbrain and NEC format.

Ask for DYNACOMP programs at your local software dealer. Write for detailed descriptions of these and other programs from DYNACOMP.

DYNACOMP, Inc. (Dept. C)
1427 Monroe Avenue
Rochester, New York 14618
24 hour message and order phone: (716) 442-8731
Toll free order phones: (800) 828-6772
(800) 828-6773
Office phone (9AM-5PM EST): (716) 442-8960

New York State residents please add 7% NYS sales tax.

EDUCATION

HODGE PODGE (Apple 48K only) Price: $14.95 Cassette/$18.95 Diskette
Let HODGE PODGE be your child's teacher. Pressing any key on your Apple will result in a different and intriguing "happening" related to the letter or number of the chosen key. The program's graphics, color and sound are a delight for children from ages 1½ to 7. HODGE PODGE is a non-intimidating teaching device which brings a new dimension to the use of computers in education. See the excellent reviews of this very popular program in INFOWORLD and SOFTALK.

TEACHER'S AIDE (Atari and PET only) Price: $13.95 Cassette/$17.95 Diskette
TEACHER'S AIDE consists of three basic modules contained in one program. The first module provides addition and subtraction exercises of varying levels of difficulty. The second module consists of multiplication problems in which the student may be tested both on the final answer and/or on the subtotal answers in the long hand procedure. Several levels of complexity are provided here as well. The third module consists of division problems; one particularly nice feature of the division module is that the long hand division steps can be displayed along with the remainder in order to clearly demonstrate the procedure by which the remainder is derived. Using TEACHER'S AIDE is not merely a drill, but rather a learning experience.

STATISTICS and ENGINEERING

DIGITAL FILTER (Available for all computers) Price: $39.95 Cassette/$43.95 Diskette
DIGITAL FILTER is a comprehensive data processing program which permits the user to design his own filter function or choose from a menu of filter forms. In the explicit design mode the shape of the frequency transfer function is specified by directly entering points along the desired filter curve. In the menu mode, ideal low pass, high pass and bandpass filters may be approximated to varying degrees according to the number of points used in the calculation. These filters may optionally also be smoothed with a Hanning function. In addition, multi-stage Butterworth filters may be selected. Features of DIGITAL FILTER include plotting of the data before and after filtering, as well as display of the chosen filter functions. Also included are convenient data storage, retrieval and editing procedures.

DATA SMOOTHER (Not available for Atari) Price: $19.95 Cassette/$23.95 Diskette
This special data smoothing program may be used to rapidly derive useful information from noisy business and engineering data which are equally spaced. The software features choice in degree and range of fit, as well as smoothed first and second derivative calculation. Also included is automatic plotting of the input data and smoothed results.

FOURIER ANALYZER (Available for all computers) Price: $19.95 Cassette/$23.95 Diskette
Use this program to examine the frequency spectra of limited duration signals. The program features automatic scaling and plotting of the input data and results. Practical applications include the analysis of complicated patterns in such fields as electronics, communications and business.

TFA (Transfer Function Analyzer) Price: $19.95/$23.95 Diskette
This is a special software package which may be used to evaluate the transfer functions of systems such as hi-fi amplifiers and filters by examining their response to pulsed inputs. TFA is a major modification of FOURIER ANALYZER and contains an engineering-oriented decibel versus log-frequency plot as well as data editing features. Whereas FOURIER ANALYZER is designed for educational and scientific use, TFA is an engineering tool. Available for all computers.

HARMONIC ANALYZER (Available for all computers) Price: $24.95 Cassette/$28.95 Diskette
HARMONIC ANALYZER was designed for the spectrum analysis of repetitive waveforms. Features include data file generation, editing and storage/retrieval as well as data and spectrum plotting. One particularly unique facility is that the input data need not be equally spaced or in order. The original data is sorted and a cubic spline interpolation is used to create the data file required by the FFT algorithm.

FOURIER ANALYZER, TFA and HARMONIC ANALYZER may be purchased together for a combined price of $51.95 (three cassettes) and $63.95 (three diskettes).

REGRESSION I (Available for all computers) Price: $19.95 Cassette/$23.95 Diskette
REGRESSION I is a unique and exceptionally versatile one-dimensional least squares "polynomial" curve fitting program. Features include very high accuracy; an automatic degree determination option; an extensive internal library of fitting functions; data editing; automatic data, curve and residual plotting; a statistical analysis (e.g.: standard deviation, correlation, coefficient, etc.) and much more. In addition, new fits may be tried without reentering the data. REGRESSION I is certainly the cornerstone program in any data analysis software library.

REGRESSION II (Available for all computers) Price: $19.95 Cassette/$23.95 Diskette
PARAFIT is designed to handle those cases in which the parameters a imbedded (possibly nonlinearly) in the fitting function. The user simply inserts the functional form, including the parameters (A(1), A(2), etc.) as one or more BASIC statement lines. Data, results and residuals may be manipulated and plotted as with REGRESSION I. Use REGRESSION I for polynomial fitting, and PARAFIT for those complicated functions.

MULTILINEAR REGRESSION (MLR) (Available for all computers) Price: $24.95 Cassette/$28.95 Diskette
MLR is a professional software package for analyzing data sets containing two or more linearly independent variables. Besides performing the basic regression calculation, this program also provides easy to use data entry, storage, retrieval and editing functions. In addition, the user may interrogate the solution by supplying values for the independent variables. The number of variables and data size is limited only by the available memory.

REGRESSION I, II and MULTILINEAR REGRESSION may be purchased together for $51.95 (three cassettes) or $63.95 (three diskettes).

ANOVA (Not available on Atari cassette or for PET/CBM) Price: $39.95 Cassette/$43.95 Diskette
In the past the ANOVA (analysis of variance) procedure has been limited to the large mainframe computers. Now DYNACOMP has brought the power of this method to small systems. For those conversant with ANOVA, the DYNACOMP software package includes the 1-way, 2-way and N-way procedures. Also provided are the Yates 2^{K-P} factorial designs. For those unfamiliar with ANOVA, do not worry. The accompanying documentation was written in a tutorial fashion (by a professor in the subject) and serves as an excellent introduction to the subject. Accompanying ANOVA is a support program for building the data base. Included are several convenient features including data editing, deleting and appending.

BASIC SCIENTIFIC SUBROUTINES, Volumes 1 and 2 (Not available for Atari)
DYNACOMP is the exclusive distributor for the software keyed to the popular texts *BASIC SCIENTIFIC SUBROUTINES, Volumes 1 and 2* by F. Ruckdeschel (see advertisements in BYTE magazine). These subroutines have been assembled according to chapter. Included with each collection is a menu program which selects and demonstrates each subroutine.

Volume 1
Collection #1: Chapters 2 and 3 - Data and function plotting; complex variables and functions.
Collection #2: Chapter 4 - Extended matrix and vector operations.
Collection #3: Chapters 5 and 6 - Random number generators (Poisson, Gaussian, etc.); series approximations.
Price per collection: $16.95 Cassette/$20.95 Diskette
All three collections are available for $44.95 (three cassettes) and $53.95 (three diskettes).

Volume 2
Collection #1: Chapter 1 - Linear, polynomial, multidimensional, parametric least squares.
Collection #2: Chapter 2 - Series approximation techniques (economization, inversion, reversion, shifting, etc.)
Collection #3: Chapter 3 - Functional approximations by iteration and recursion.
Collection #4: Chapter 4 - CORDIC approximations to trigonometric, hyperbolic, exponential and logarithmic functions.
Collection #5: Chapter 5 - Table interpolation, differentiation and integration (Newton, LaGrange, splines).
Collection #6: Chapter 6 - Methods for finding the real roots of functions.
Collection #7: Chapter 7 - Methods for finding the complex roots of functions.
Collection #8: Chapter 8 - Optimization by steepest descent.
Price per collection: $14.95 Cassette/$18.95 Diskette

All eight collections are available for $99.95 (eight cassettes) and $129.95 (eight diskettes).
Because the texts are a vital part of the documentation, *BASIC SCIENTIFIC SUBROUTINES, Volumes 1 and 2* are available from DYNACOMP:

BASIC SCIENTIFIC SUBROUTINES, Vol. 1 (319 pages): $19.95 + 75¢ postage
BASIC SCIENTIFIC SUBROUTINES, Vol. 2 (790 pages): $23.95 + $1.50 postage

See reviews in KILOBAUD, Dr. Dobbs, and ACCESS.

NEW **SOFTNET** (Apple II and TRS-80 48K diskette only) Price: $129.95
SOFTNET may be used to create models of liquid pipeline systems to evaluate their flow performance. Up to 150 nodes with up to 150 connecting elements may be simulated, and models may be combined to form yet larger models. If you are involved in water distribution systems, chemical fluid flow problems, building plumbing, or similar situations, this is an ideal analysis tool.

NEW **FILTER ANALYSIS** (Apple only) Price: $19.95 Cassette/$23.95 Diskette
FILTER ANALYSIS is the ideal program for determining the frequency response of passive filters. Any number of RLC components may be included, and any number of poles treated. FILTER ANALYSIS features its own mini-language which makes circuit description simple. Results may be printed in tabular form or plotted in HIRES graphics (decibels versus log-frequency).

ACTIVE CIRCUIT ANALYSIS (Available for all computers) Price: $35.95 Cassette/$39.95 Diskette
With ACAP you may analyze the response of an active or passive component circuit. The circuit may be probed at equal steps in frequency, and the resulting complex voltages at each component juncture examined; the frequency response of a filter or amplifier may be completely determined with respect to both amplitude and phase. In addition, ACAP prints a statistical analysis of the range of voltage responses which result from tolerance variations in the components. ACAP is easy to learn and use. Circuit descriptions may be saved onto cassette or diskette to be recalled at a later time for execution or editing. ACAP should be part of every circuit designer's program library. Requires 48K.

LOGIC SIMULATOR (Available for all computers) Price: $35.95 Cassette/$39.95 Diskette
Test your complicated digital logic design with respect to given set of inputs to determine how well the circuit will operate. The elements which may be simulated include multiple input AND, OR, NOR, EXOR, EXNOR and NAND gates, as well as inverters, J-K and D flip-flops, and one-shots. Inputs may be clocked in with varying clock cycle lengths/displacements and delays may be introduced to probe for glitches and race conditions. A timing diagram for any given set of nodes may be plotted. Save your breadboarding until the circuit is checked by LOGIC SIMULATOR. Requires 48K.

NEW **BEAM DEFLECTION** (Available for all computers) (disk/diskette only) Price: $29.95 Diskette/$32.45 Disk
BEAM DEFLECTION Is the first in DYNACOMP's new series of structural analysis software packages. It consists of two programs. The first program permits the development of data files which describe the problem. For example, the ends of the beam may be pinned, clamped or free. The beam may be uniformly supported by an elastic bed, or held up by springs variously placed and having differing spring constants. The elasticity and cross section of the beam may vary along its length. The load may be uniformly distributed or it may include discrete forces. The beam may be pinned at various points along its length. And so on. All this information may be easily entered and edited using the data input program.

Following this the analysis program is called. The calculated results are the stress and deflections of the beam, both in numerical and graphical form. since the input data is saved, cases may be easily re-run with modification, thereby permitting iterative design.

The documentation which comes with BEAM DEFLECTION clearly shows how to use the software. In addition, three text problems are described and demonstrated to ensure that you understand how to use the program. Also, helpful theoretical information is supplied in the appendix.

STATTEST (Not available on Atari cassette or for PET/CBM) Price: $19.95 Cassette/$23.95 Diskette
This is a statistical inference package which helps you make wise decisions in the face of uncertainty. In an interactive fashion you can build and edit data files and test the differences in means, variances and proportions. STATTEST will also perform data analysis as well as do linear correlation and regression. This menu-directed statistical workhorse is rounded out with a chi-square contingency test and a (uniform and normal) random sample generator. The documentation is written by a college professor who guides you through the various tests.

ABOUT DYNACOMP

DYNACOMP is a leading distributor of small system software with sales spanning the world (currently in excess of 50 countries). During the past three years we have greatly enlarged the DYNACOMP product line, but have maintained and improved our high level of quality and customer support. The achievement in quality is apparent from our many repeat customers and the software reviews in such publications as COMPUTRONICS, 80 Software Critique, A.N.A.L.O.G., Softalk, Creative Computing and Kilobaud. DYNACOMP software has also been chosen for demonstration on network television. Our customer support is as close as your phone. It is always friendly. The staff is highly trained and always willing to discuss products or give advice.

CIRCLE 184 ON READER SERVICE CARD

and permits some parallel processing, it has several disadvantages. The primary disadvantage is that it still requires the user to wait while the computer processes the data. At least in this version the user has something to occupy his time—the prompt displayed before the processing began. But if the user can satisfy this prompt very quickly, he may spend considerable time waiting for the computer to finish its task just as before. This version can be improved by following a second principle of parallel processing.

Second Principle: *Interruptable processing*. Ideally, priority should be given to the user's time, rather than the computer's After all, we buy computers to save our time, not theirs. This can be accomplished with parallel processing by providing a way for the user to interrupt the computer when he completes his task before the computer completes its task. Once interrupted the computer could, for example, accept user input, reply with yet another prompt, and then return to its processing task while it awaits the next user response.

One technique for achieving interruptable processing by the computer is illustrated in Listing 3. There I have taken the iterative calculation subroutine from Listing 2 and modified it to permit interruptable processing by adding lines 359 and 372 and changing lines 370 and 291.

This routine takes advantage of the ability of the Apple to monitor the current state of the keyboard by reading the contents of decimal memory location -16348. Whenever a key is pressed, the value in this memory location becomes the numeric code of the character typed which is always greater than 128. Referencing a second memory location, -16368 (decimal), clears the first location until another key is pressed.

Line 359 is imbedded within the FOR... NEXT loop and is executed with each loop. This line examines the keyboard memory location to determine whether a key has been pressed, enabling the computer to monitor the keyboard while performing these calculations.

If a key has been pressed, line 359 exits the calculation loop after setting LO equal to the next loop index value, PMT+1. Line 370 checks to make sure the value of SOURCE$ has not already been entered, then prompts the user for the value of SOURCE$ and resets the keyboard memory location. Line 372 returns the program to the calculation subroutine beginning with the next loop if the routine has not already been completed.

The net result of this routine is that if the user presses any key during the execution of this subroutine, the program will respond by halting execution and accepting the user response to the previous prompt, then resume execution until the calculations are completed.

Listing 3.

```
200  REM  ***********************
210  REM  CALCULATION SUBROUTINE
220  REM  ***********************
225 LO = 1
230 I = IN / 12
240 MO = YEARS * 12
250 A = AMOUNT * I * (I + 1) ^ MO / (((I + 1) ^ MO) - 1)
260  DEF  FN MR(X) = ( INT (100 * (X + .005))) / 100
270 A =  FN MR(A)
280 NL = 0:BALANCE(0) = AMOUNT:TIN(0) = 0
290  FOR PMT = LO TO MO
300 I1(PMT) =  FN MR(I * BALANCE(PMT - 1))
310 PRINCIPAL(PMT) =  FN MR(A - I1(PMT))
320  IF PMT <  > MO THEN  GOTO 340
330 PRINCIPAL(PMT) = BALANCE(PMT)
340 BALANCE(PMT) =  FN MR(BALANCE(PMT - 1) - PRINCIPAL(PMT))
350 TIN(PMT) =  FN MR(TIN(PMT - 1) + I1(PMT))
359 ZZ =  PEEK ( - 16384): IF ZZ > 128 THEN LO = PMT + 1: GOTO 370
360  NEXT PMT
370  IF SOURCE$ = "" THEN  INPUT SOURCE$: POKE  - 16368,0
372  IF PMT < MO GOTO 290
```

This solution, while better than noninterruptable execution, still has problems. If, for example, the user presses two or more keys before the program halts execution, only the last key will be stored in the keyboard memory location and the user may have to backspace and reenter the response.

Another problem, far more serious than the first, is that the same procedures which increase the efficiency of the program by giving the user unequivocal priority, may themselves introduce inefficiency in other aspects of the program by working at odds with other efficiency-oriented procedures.

To avoid, or at least minimize, these unanticipated conflicts, it is necessary to coordinate these parallel processing techniques with the other techniques which also increase efficiency so they don't defeat each other. This leads to the third principle of parallel processing.

Third Principle: Coordinate parallel processing with other techniques designed to make programs more efficient. For example, parallel processing should not be allowed to make it necessary to do something more than once, whether it is reading a sector from a disk or performing a calculation, or anything else. A basic principle for integrating parallel processing into programs is that, with few exceptions, it should not make it necessary, to perform any task more than once.

The primary strategy for coordinating parallel processing design with other strategies to produce more efficient programs is to introduce a transition phase into programs when the computer is handling control back over to the user which continues to carry out the processes performed by the central processing unit to the point where they may be most efficiently terminated while still permitting the simultaneous (or at least apparently simultaneous) use of the keyboard by the user. This is done by creating, for this transition phase, a timesharing capability for the microcomputer.

This strategy is illustrated by the following lines which may be substituted for lines 359, 370, and 372 in Listing 3.

```
359 ZZ = PEEK (-16384): IF ZZ> 128
THEN K$ = K$ + CHR$(ZZ): POKE
-16368,0: PRINT CHR$(ZZ);
370 IF K$ =""THEN INPUT
SOURCE$
372 IF K$<>"" THEN INPUT "";
SOURCE$: SOURCE$ = K$ +
SOURCE$
```

"This one is called 'Kafka.' It is programmed to try to prevent the user from figuring out how to play it."

THE ULTIMATE APPLE*

COOLING FAN $\$69^{95}$

- ★ Easy Installation
- ★ No modification of Apple required.
- ★ Color matches Apple.
- ★ Switch on front controls fan, computer and monitor.
- ★ Ultra-quiet, reliable fan.
- ★ Completely eliminates problems caused by overheating

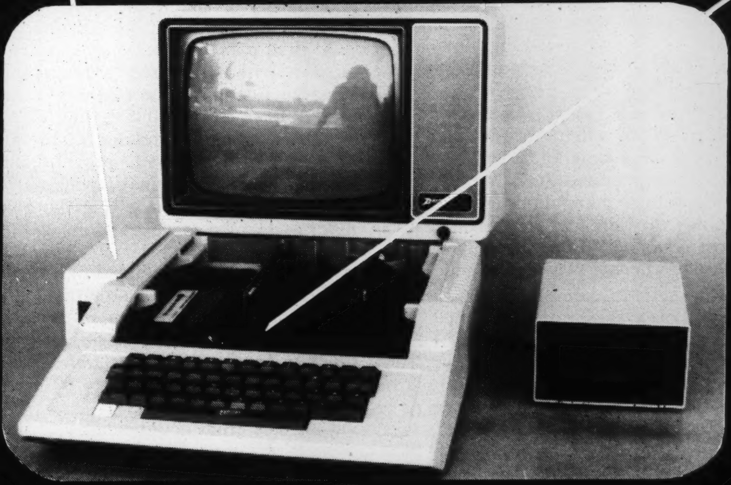
16K RAM CARD

- ★ Upgrade your 48K Apple II to full 64K of RAM.
- ★ Fully software and hardware compatible with the Apple language card and microsoft Z80 card.
- ★ Eliminates the need for the Applesoft or Integer Basic ROM card when used in conjunction with DOS 3.3.
- ★ Allows you to run Apple Fortran or Pascal with no difficulty.
- ★ Available as bare board, kit, or assembled and tested board.

PRICE REDUCED

ASSEMBLED & TESTED $49.95

BARE CARD ...... $14.95 **KIT $44.95**



DISK DRIVE $\$299^{95}$

- ★ Includes metal cabinet
- ★ Color matches Apple
- ★ 35 Tracks/single side
- ★ Includes cable
- ★ Use with Apple II Controller

ORDER TOLL FREE

800-538-5000

800-662-6279

(CALIFORNIA RESIDENTS)

MasterCard VISA

MONITORS

BLACK & WHITE

NEC	JB1201M	$\$169^{00}$
ZENITH	ZUM-121	$\$119^{00}$

COLOR

AMDEK	COLOR I	$\$335^{00}$
NEC	JC 1201M	$\$329^{00}$

PRINTERS

MX-80

MX-80FT

MX-800

CALL FOR PRICE

WE HAVE APPLE AND TRS-80 INTERFACE CARDS AND CABLES

DISKETTES

5¼″

ATHANA	SS SD SOFT	24.95
MEMOREX	SS SD SOFT	26.95
VERBATIM	SS SD SOFT	29.95
VERBATIM	10 SECTION HARD ..	29.95

8″

VERBATIM	SS SD SOFT	44.95

JDR MICRODEVICES, INC.

1224 S. Bascom Avenue
San Jose, CA 95128
800-538-5000 • 800-662-6279 (CA)
(408) 995-5430 • Telex 171-110

© 1982 JDR MICRODEVICES, INC.

CIRCLE 211 ON READER SERVICE CARD

VISIT OUR RETAIL STORE

— NEW HOURS —
M-W-F, 9-5
T-Th., 9-9 Sat. 11-3

PLEASE USE YOUR CUSTOMER NUMBER WHEN ORDERING

TERMS: For shipping include $2 for UPS Ground or $3 for UPS Blue Label Air. Items over 5 pounds require additional shipping charges. Foreign orders, include sufficient amount for shipping. There is a $10 minimum order. Bay Area and Los Angeles Counties add 6½% Sales Tax. Other California residents add 6% Sales Tax. We reserve the right to substitute manufacturer. Not responsible for typographical errors. Prices are subject to change without notice. We will match or beat any competitor's price provided it is not below our cost.

If a key is pressed, the new line 359 stores the value of the key in string K$, clears the memory location by referencing decimal location -16368, and prints the value of the key on the screen. Line 372 determines whether one or more keys were pressed during the calculations, and if so, permits the user to input the remainder of the response, then combines that with the string K$ to reconstruct the entire response.

Line 370 permits the user to input the entire response if no keys were pressed during the calculations. This method permits the user to press more than one key on the keyboard and have the response registered even while the calculations are being performed without passing control completely back to the keyboard.

It should be pointed out that, when viewed from within the machine, this is not parallel processing because the computer does not simultaneously perform these calculations and register input data. Instead, this is time-sharing in which both activities are conducted within a very short time interval to give the illusion to the user of simultaneous processes. When viewed from the larger perspective of the man-machine interface, however, this is parallel processing because it permits both the user and the machine to carry on processing activities at the same time.

This revised subroutine monitors the keyboard during lengthy processes by the computer. However, when a key is pressed, rather than immediately returning control to the user, it stores the keys as they are entered in an array, K$, which acts as a buffer. It also prints out the stored keys on the monitor so the user will know they are being registered. Control is not returned fully to the user until the computer is done with its internal processing task.

This strategy has the advantage of permitting the user response to overlap more fully with the internal processing to the computer, minimizing the interruption of the internal processing while still not requiring the user to wait needlessly.

Advantages And Limitations

Parallel processing by the microcomputer and the user offers the opportunity to make running programs more efficient and less frustrating to computer users. It should both reduce waiting time and decrease the overall time required to run any program.

However, parallel processing is not a panacea which will overcome all limitations of microcomputers for all users and for all programs. It will be of little use where the computations or computer activities are already so fast they are almost unnoticed by the user. It will be less useful where it is difficult to anticipate the direction of the program and, hence, difficult to know which prompt to display next, and more useful where there is a clear direction.

Keyboard monitoring routines such as those used in these examples to facilitate parallel processing are most effectively used in program loops. Their use in other time-consuming but noniterative stages of the program may require multiple calls to a monitoring subroutine.

Nor is this technique likely to eliminate all waiting. Most programs are not so balanced that neither the user nor the computer need ever wait. One problem is that different users may interact at very different speeds. For someone less familiar with the program, who reads slower, or who must search through papers for the proper data, the input time may be considerably longer than for the experienced user who has everything at hand and hardly even needs to read the prompts to know what to enter next.

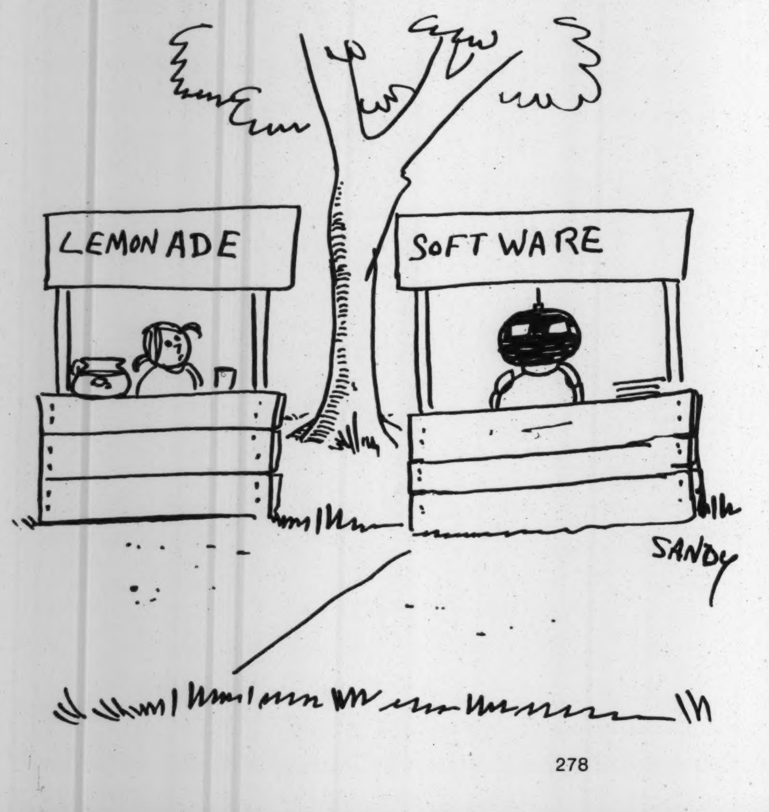
At first, parallel processing appears to conflict with structured programming, sometimes requiring prompts to be separated from related code and placed among seemingly unrelated code. The problem is structured programming, which creates subroutines having only a single function, looks only at the computer part of the process and ignores the user.

With only slight modification it is possible to reconceptualize structured programming as the creation of separate modules or subroutines having a single function for the computer *and* a single function (which may be very different) for the user.

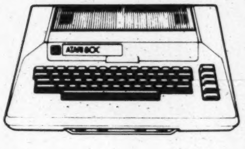
Unless carefully coordinated with other aspects of the program, parallel processing during disk I/O might result in additional disk accesses resulting in more wear and tear on the disk drive and diskettes. This may be minimized with careful monitoring and design of the program. However, parallel processing should be used only where the additional complexity of programming is outweighed by efficiency of operation.

This type of programming may not be for everyone. Just as there are people who enjoy commercials on television so they can take a breather, raid the icebox, or answer the call of nature, some people may like programs with similar built-in pauses when they can do something else.

There is no reason to expect that everyone's work habits will be enhanced by this type of programming. But even the most "laid-back" programmer can be bothered by those times when he must wait long enough to be irritated but not long enough to be productive. Perhaps parallel processing programming could eliminate these awkward gaps to the benefit of us all.



ATARI ™



800 16K	**$619**
800 48K (with mosaic 32K board)	**$714**
800 48K (with Atari memory)	**$779**
400 16K	**$269**

410 Recorder	$ 75
810 Disk Drive	$439
825 Printer	$579
830 Modem	$155
850 Interface	$169
481 Entertainer	$ 79
482 Educator	$119
483 Programmer	$ 55
484 Communicator	$299
853 16K Ram	$ 79
The Bookkeeper Kit	$169

ATARI Software

CX4104 Mailing List	$ 19
CX404 Word Processor	$115
CXL4007 Music Composer	$ 45
Programming 2 & 3	$ 22
Conversational Languages	$ 45
CX4018 Pilot	$ 59
CX405 Pilot	$ 99
CXL4003 Assembler Editor	$ 45
CX8126 Microsoft Basic	$ 67
CXL4022 Pac-Man	$ 33
CX8130 Caverns of Mars	$ 29
CXL4020 Centipede	$ 33
CXL4006 Super Breakout	$ 28
CXL4008 Space Invaders	$ 28
CXL4009 Computer Chess	$ 28
CXL4011 Star Raiders	$ 35
CXL4012 Missile Command	$ 28
CXL4013 Asteroids	$ 28
The Bookeeper	$105
Home Filing Manager	$ 37
Atari Speed Reading	$ 54
My First Alphabet	$ 26

Business & Utilities

Visicalc	$169
Mail Merge	$ 20
Data Perfect	$ 75
Letter Perfect	$105
Text Wizard	$ 65
Disk Detective	$ 20
Datasm 65 2.0	$ 59
File Manager	$ 65
Syn Assembler	$ 34
Page 6	$ 20
Atari World	$ 39
K-Dos	$ 59
Micropainter	$ 23
Color Print	$ 27
Lisp Interpreter	$ 79
Bishops Square	$ 20
Graphic Master	$ 27
Graphic Generator	$ 17
Basic Compiler	$ 65

Programming Techniques

Display Lists	$ 17
Horiz/Vert Scroll	$ 17
Page Flipping	$ 17
Basics of Animation	$ 17
Player Missile Graphics	$ 24
Sound	$ 17
Data Files	$ 24

For Fast Delivery, send certified or cashier checks, money orders, or direct bank wire transfers. Personal checks allow 2 to 3 weeks to clear. Prices reflect a cash discount only and are subject to change. Shipping—Software ($2.00 Minimum). Hardware—call. Foreign inquiries invited — add 15% for shipping. Nevada residents add sales tax.

NEW LOWER PRICES

APPLE SOFTWARE/NEW

Lazer Maze	$ 20
Federation	$ 20
Shootout at the O.K. Galaxy	$ 19
Sea Fox	$ 20
Space Kadet	$ 24
Mars Cars	$ 20
Money Muncher	$ 20
Vortex	$ 20
Pandora's Box	$ 20
High Orbit	$ 20
Kamikaze	$ 23
Shuttle Intercept	$ 23
Free Fall	$ 20
Wayout	$ 27
The Blade of Blackpool	$ 27
Ali Baba & the Forty Thieves	$ 22
Guadacanal	$ 39
The Cosmic Balance	$ 27
Galactic Gladiators	$ 27
Juggles Rainbow	$ 30
Bumble Games	$ 39
Bumble Plot	$ 39
Gertrude's Secrets	$ 49
Gertrude's Puzzles	$ 49
Rocky's Boots	$ 49
Pest Patrol	$ 20
Lunar Leeper	$ 20
Cannonball Blitz	$ 23
Laffpak	$ 23
Frazzle	$ 17
Firebug	$ 17
S.E.U.I.S.	$ 27
Snooper Troops #1	$ 30
Snooper Troops #2	$ 30
Story Machine	$ 23
Face Maker	$ 23
Lazer Silk	$ 20
Zenith	$ 23
Phaser Fire	$ 20
Prisoner II	$ 22

COMPUTER OUTLET

*** SPECIALS OF THE MONTH ***

ELEPHANT DISKS (BOX)	**$ 22**
HAYES SMARTMODEM	**$229**
FRIENDLY TERMINAL SOFTWARE PACKAGE (ATARI)	**$ 39**
MOSAIC 32K RAM	**$ 99**
RAMDISK (128K)	**$429**
AMDEK COLOR I MONITOR	**$329**
PERCOM DOUBLE DENSITY DRIVE	**$679**
NEC 8023A PRINTER	**$479**
K-DOS	**$ 59**
OS/A +	**$ 59**
BASIC A +	**$ 59**
FLIP N' SORT DISKETTE BOX (Holds 50 Diskettes)	**$ 21**
FLIP-SORT CARTRIDGE BOX (Holds 10 Atari Computer Cartridges)	**$ 21**
AXIOM GP-100 GRAPHICS PRINTER	**$299**
AXIOM IMP-4 GRAPHICS PRINTER	**$499**
SYSTEM SAVER FAN	**$ 65**
THE JOYPORT	**$ 53**
THE GRAPPLER PLUS	**$ 139**
ANADEX PRINTER	**$1289**
AMDEX COLOR II MONITOR	**$ 759**
VERBATIM DISKS (BOX)	**$ 27**

Computer Outlet

Park Place — Upper Level
1095 E. Twain — (702) 796-0296
Las Vegas, Nevada 89109

Call Toll Free **800-634-6766**
We accept Major Credit Cards
Mon.-Fri. 8 A.M.-6 P.M.
Sat. 9 A.M.-5 P.M.

CIRCLE 149 ON READER SERVICE CARD

NEW

Atari

Atari Program Exchange

Salmon Run	$ 19
Galahad and The Holy Grail	$ 19
Seven Card Stud	$ 13
Advanced Music System	$ 23
Elementary Biology	$ 25
Frogmaster	$ 19
Checker King	$ 19

Automated Simulations

Upper Reaches of Apshai	$ 15
Curse of Ra	$ 15
King Arthur's Heir	$ 20
Escape from Vulcan's Isle	$ 20
Crypt of the Undead	$ 20
The Nightmare	$ 20

Broderbund

David's Midnight Magic	$ 23
Track Attack	$ 20
Star Blazer	$ 22
Choplifter	$ 23
Deadly Secrets	$ 23
Stellar Shuttle	$ 20

Datasoft

Spell Wizard	$ 53
Sands of Egypt	$ 27
O'Riley's Mine	$ 23
Rosen's Brigade	$ 23
Fathoms Forty	$ 23

Gebelli

Doctor Goodcode's Cavern	$ 20
Firebird	$ 34
Embargo	$ 34

Innovative Design

Pool 400	$ 27
Speedway Blast	$ 27

JV Software

Ghost Encounters	$ 20

K-Byte

K-razy Kritters	$ 34
K-Star Patrol	$ 34
K-Razy Antiks	$ 34

L & S Computerware

Crossword Magic	$ 34

Lightning Software

Master Type	$ 27

On-Line

Frogger	$ 23
Ulysses and The Golden Fleece	$ 23
Ultima I	$ 27
Ultima II	$ 39

Roklan Corp.

Gorf (d)	$ 27
Wizard of Wor (d)	$ 27
Anti Sub Patrol (d)	$ 20
Gorf (CT)	$ 30
Wizard of Wor (CT)	$ 30
Anti Sub Patrol (C)	$ 15

Sentient

Cyborg	$ 23
Gold Rush	$ 23

Sirius

Space Eggs	$ 20
Sneakers	$ 20
Cyclod	$ 20
Snake Byte	$ 20
Bandits	$ 23
Way Out	$ 27
Fast Eddy	$ 20
Deadly Duck	$ 20
World War I	$ 23
Beanie Bopper	$ 23

Strategic Simulations

Battle of Shiloh	$ 27
Tigers in the Snow	$ 27
The Cosmic Balance	$ 27

Synapse

Slime	$ 23
Shamus	$ 23
Apocalypse	$ 23
Raptillian	$ 23
Picknick Paranoia	$ 23
Claim Jumper	$ 23

Dysan
CORPORATION

Solve your disc problems, buy 100% surface tested Dysan diskettes. All orders shipped from stock, within 24 hours. Call toll FREE (800) 235-4137 for prices and information. Visa and Master Card accepted.

PACIFIC
EXCHANGES
100 Foothill Blvd.
San Luis Obispo, CA
93401 (In Cal. call
(805) 543-1037)

CIRCLE 262 ON READER SERVICE CARD

EDUCATIONAL SOFTWARE
TRS-80, COLOR COMPUTER, PET
& APPLE II

ELEMENTARY	MATH
SCIENCE	HISTORY
GEOGRAPHY	ACCOUNTING
ECONOMICS	BUSINESS ED.
FOREIGN LANG.	PHYSICS
GRAMMAR	FARM RECORDS

Write for FREE Catalogue:

MICRO LEARNINGWARE, Box
2134, N Mankato, MN 56001
(507) 625-2205
VISA & MASTER CARD ACCEPTED

We pay 15% royalty for Educational Programs listed with us.
TRS-80 is a registered trademark of TANDY CORP.
PET is a trademark of COMMODORE BUS. MACHINES.
APPLE is a trademark of APPLE COMPUTER CO.

CIRCLE 234 ON READER SERVICE CARD

FIRST and FINEST
In Systems Software for Atari® and Apple®

MAC/65

First we delivered Atari's Assembler/Editor (the cartridge).

Then we produced our enhanced "EASMD."

Now OSS is introducing the **finest** integrated assembly language development system yet!

In addition to being ideal for writing small, "quick and dirty" subroutines and programs, **MAC/65** shows its full power and speed when used with even the most complex of large assembly language source files.

Naturally, **MAC/65** is upward compatible with both EASMD and the Atari cartridge. And, of course, the object code output is also compatible with OS/A+, Atari DOS, and/or Apple DOS, as appropriate.

MAC/65 .... **$80.00***

OS/A+

Optimized Systems Software — the group that produced **both** the **first** Apple DOS **and** the **first** Atari DOS — now brings you OS/A+, which combines the **finest** features of these and other successful personal computer operating systems.

OS/A+ is the **first** and **finest** operating system available for **both** Apple II and Atari computers and features a keyboard-driven, easy-to-use command processor. In addition to several simple resident commands, OS/A+ allows logical and readable requests for even the most sophisticated utility commands. In fact, the user can even add system commands as desired.

But the real power and flexibility of OS/A+ is its ability to easily interface to devices and **disk drives** of virtually any kind and size. File compatibility (with Apple DOS or Atari DOS, as appropriate), device independence, batch processing, easy of use — OS/A+ truly brings the **finest** in operating systems to **your** computer.

AND NOW OS/A+ (for standard Atari or Apple drives) is included as a part of **every** standard OSS language package. Versions of OS/A+ for some higher capacity drives available at extra cost.

Unless otherwise noted, all OSS products require 48K and at least one disk drive. We recommend 64K for the Apple version of OS/A+

SpeedRead+

The **first** and still **finest** speed reading tutor designed for **you** to use on **your** computer is available **only** from OSS.

SpeedRead+ uses time-proven techniques to train **you** to instantly recognize words and phrases, and yet it goes far beyond what mere mechanical devices are capable of.

SpeedRead+ exercises your peripheral vision, improves your eye movement and timing, and generally works **with you** at your pace... now and in the future.

NOTE: The Atari version of SpeedRead+ needs only 16K of RAM.

SpeedRead+ **$59.95**

tiny
C

As a product of Tiny C Associates, **tiny-c** was the **first** structured language interpreter for microcomputers. Now OSS brings this innovative interpretive language to **your** home computer. While not having the speed and power a true **C** compiler, **tiny-c** is an excellent choice for the programming student who is ready to begin learning the valuable techniques of structured languages.

tiny-c provides an easy-to-use, easy-to-modify environment that encourages experimentation while promoting proper programming style. The **tiny-c** package includes not only a comprehensive and instructional user manual but also **complete source.**

tiny-c **$99.95***

C/65
NOW AVAILABLE!

The **first** native mode **C** compiler ever produced for Atari **and** Apple computers.

C/65 supports a very usable subset of the extremely powerful and popular **C** language. Just as **C** is used by the most sophisticated programmers from the professional and academic communities, so shall **C/65** prove to be a powerful and much-needed tool for 6502 software developers.

C/65 supports integer and character types (and arrays), pointers, fully recursive functions, and much more.

NOTE: C/65 requires MAC/65 or an equivalent assembler. Two disk drives recommended but not required.

C/65 .... **$80.00***

TRADE UP

Trade up from Atari's Microsoft Basic to **BASIC A+** and receive a **$15 discount.** Call or write for details.

BASIC A+
"From the authors of Atari BASIC..."

It's a fact! OSS gave you that **first** and **most popular** language for Atari Home Computers. But why be content with the **first** when you can have the **finest**?

BASIC A+ is the **only** logical upgrade available to the Atari BASIC programmer. While retaining **all** the features which make Atari BASIC so easy to use, we've **also** given BASIC A+ features that place it at the forefront of modern interpretive languages. BASIC A+ will let **you** explore the worlds of structured programming, superior input/output, helpful programming aids, and even a very comprehensive PRINT USING command. **And**, exclusively for the Atari computer, an almost unbelievable array of PLAYER/MISSILE GRAPHICS commands and functions.

BASIC A+ **$80.00***

***REMEMBER**: Standard OS/A+ is **included** at no extra charge with BASIC A+, MAC/65, C/65, and tiny-c.

ATARI, APPLE II, and TINY C are trademarks of Atari, Inc., Apple Computer, Inc., and Tiny C Associates, respectively. ***SpeedRead+***, MAC/65, C/65, BASIC A+ and OS/A+ are trademarks of Optimized Systems Software, Inc.

Optimized Systems Software, Inc.,
10379 Lansdale Ave., Cupertino, CA 95014, (408) 446-3099

CIRCLE 259 ON READER SERVICE CARD

Parallel Processing, continued...

Implications For The Future

Assuming you use some merit in the concept of parallel processing and want to develop usable routines for your own computer, there still may be some practical difficulties to overcome. For example, in this program for the Apple II, there are several awkward problems with these routines. If keys are pressed in rapid succession while the computer is in its time-sharing routine the routine may not examine the memory register often enough, causing some keystrokes to be missed. Such problems might be resolved by assembly language routines which could work more quickly. But the best solution appears to be to rewrite the console driver to include this capability.

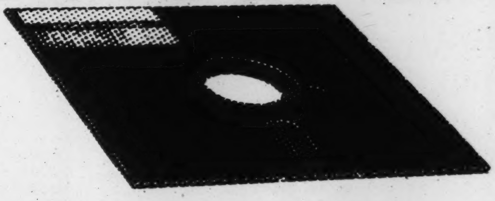
In principle, there should be no reason why one could not write console drivers which encourage and permit such time-sharing and parallel processing in microcomputers, and do so more efficiently than basic subroutines. Such drivers could make it considerably easier for the programmer relieving him of the need to create keyboard monitoring subroutines in the code.

The Apple III console driver is written with just such a feature. It is called a type ahead ability. As many as 128 characters can be entered from the keyboard while the program is processing elsewhere. The characters are processed in sequence when the computer is ready for them. It is even possible to enter several different responses in sequence while awaiting the computer. Each sequence which satisfies a prompt by the computer will be processed, and the remaining characters in the buffer will be saved and interpreted as the response to the next computer prompt. Clearly, this feature makes parallel processing much easier for the Apple III.

However, a console driver by itself is not sufficient to take maximum advantage of parallel processing. It is still necessary for the programmer to reconceptualize the programming task and resequence the activities to coordinate user and computer.

To be most effective, parallel processing program design must go beyond the mere alteration of minor parts of the code. It must also involve a more realistic assessment of the imbalances in the program sequence and develop ways to coordinate user and computer so neither must wait any longer than necessary. Parallel processing is a realistic goal for microcomputing and should be expected of good programs. Perhaps soon we will no longer consider a program "user-friendly" if it requires the user to wait for long periods of time needlessly. ☐

YOU NEVER HAD IT SO SOFT!



SOFTWARE FOR YOUR ATARI, APPLE, COMMODORE OR VIC!

ATARI HOME COMPUTER PROGRAMS

HOME OFFICE	
CX404 ATARI Word Processor	$119.00
CX8102 Calculator	$29.00
CX412 Dow Jones Investment Evaluator	$99.00
CX4109 Graph It Joystick optional	$17.00
CX4104 Mailing List	$20.00
CX4115 Mortgage & Loan Analysis	$13.00
CX4103 Statistics I	$20.00
CX8107 Stock Analysis	$20.00
CXL4015 TeleLink I	$23.00
HOME STUDY	
CX4101 An Invitation to Programming I	$20.00
CX4106 An Invitation to Programming 2	$23.00
CX4117 An Invitation to Programming 3	$23.00
CX4107 Biorhythm	$13.00
Conversational Languages (ea.)	$46.00
CX4121 Energy Czar	$13.00
CX4114 European Countries & Capitals	$13.00
CX4108 Hangman, Joystick optional	$13.00
CX4102 Kindgom	$13.00
CXL4007 Music Composer	$34.00
CX4123 Scram, uses joystick	$20.00
CX4112 States & Capitals	$13.00
CX4110 Touch Typing	$20.00
HOME ENTERTAINMENT	
PAC MAN	$35.00
CENTIPEDE	$35.00
CAVERNS OF MARS	$32.00
CXL4013 Asteroids	$29.00
CXL4004 Basketball	$27.00
CX4105 Blackjack	$13.00
CXL4009 Computer Chess	$29.00
CXL4012 Missile Command	$29.00
CXL4008 Space Invaders	$29.00
CXL4011 Star Raiders	$39.00
CXL4006 Super Breakout	$29.00
CXL4010 3-D Tic-Tac-Toe	$27.00
CXL4005 Video Easel	$24.00
PROGRAMMING LANGUAGES & AIDS	
CXL4003 Assembler Editor	$47.00
CXL4002 ATARI BASIC	$47.00
CX8126 ATARI Microsoft Basic	$70.00
CXL4018 PILOT	$72.00
CX405 PILOT(Educational)	$105.00

ATARI PROGRAM EXCHANGE:	
Eastern Front '41	$25.50
Avalanche	$15.50
Outlaw	$15.50
747 Landing Simulation	$15.50
Babel	$15.50
Dog Daze	$15.50
Downhill	$15.50
Attack!	$15.50
Blackjack-Casino	$15.50
Reversi II	$15.50
Domination	$15.50
Solitare	$15.50
Disk Fixer	$15.50
Supersort	$15.50
Data Management	$15.50
Chameleon	$15.50
Instedit	$15.50
Insomnia	$15.50
My First Alphabet	$25.50
Mapware	$18.00
Number Blast	$11.50
Family Cash Flow	$15.50
Weekly Planner	$15.50
Bowler's Data Base	$13.00
Banner Generator	$11.50
Visicalc	$189.00
Letterperfect (Word Processor)	$99.00
Data Soft	
Textwizzard	$89.00
Canyon Climber	$24.00
Tumble Bug	$24.00
Shoot Arcade	$24.00
Pacific Coast	$24.00
Bishops Square	$24.00
Micro Painter	$27.00
Data Sam	$119.00
Clowns & Balloons	$24.00
Color Print	$32.00
Graphics Master	$30.00
Data Lisp	$70.00
Mail List	$20.00
OnLine	
Jaw Breaker	$27.00
MouskATTACK	$31.00
Invasion Orion	$18.50
Mission Asteroid	$22.00
The Next Step	$34.00
Softporn	$27.00
Wizzard & Princess	$29.00
Upper Reaches	$32.00
Curse of Ra	$32.00
Arcade Plus	
Ghost Hunter (cassette)	$24.00
Ghost Hunter (disk)	$30.00

K-Byte	
K-Byte Krazy Shoot Out (ROM)	$39.00
K-DOS	$69.00
K-Razy Kritters	$39.00
K-Star Patrol	$39.00
K-Razy Antiks	$39.00
Stick Stand	$6.99
Compumax	
Accounts Receivable	$110.00
General Ledger	$110.00
Inventory	$130.00
Payroll	$110.00
Personal Finance	$130.00
Synapse	
File Manager 800	$79.95
Dodge Racer	$19.00
Chicken	$24.00
Slime	$24.00
Nautilus	$24.00
Disk Manager	$24.00
Fort Apocalypse	$24.00
Assembler	$39.00
Protector	$24.00
Shamus	$24.00
Page 6	$24.00
EPYX (Automated Simulation)	
Ricochet	$14.50
Crush, Crumble & Chomp	$24.00
Star Warrior	$29.00
Rescue at Rigel	$24.00
Datestones	$16.00

APPLE

Apple Dictionary	$79.00
Visicalc	$189.00

— CALL FOR PRICES ON —

Visicalc Advance
Visicalc Business Forcast
Visischedule
Visiterm
VISI FILE
VISI DEX
VISI PACK
VISI PILOT
VISITREND

COMMODORE BUSINESS MACHINES

SOFTWARE

Word Pro 5 Plus	$319.00
Word Pro 4 Plus	$299.00
Word Pro 3 Plus	$199.00
Commodore Tax Package	$589.00
Visicalc	$189.00

Medical Billing	$449.00
The Source	$89.00
OZZ Information System	$289.00
Dow Jones Portfolio	$129.00
Pascal	$239.00
Legal Time Accounting	$449.00
Word Craft 80	$289.00
Power	$79.00
Socket-2-Me	$20.00
Jinsam	$Call
MAGIS	$Call
CPA	$Call
Real Estate Package	$Call
The Manager	$209.00
Softrom	$129.00
BPI Inventory Control	$319.00
BPI Job Costing	$319.00
BPI Payroll	$319.00
BPI General Ledger	$329.00
Creative I SAM	$79.00
Creative General Ledger	$229.00
Creative Accounts Receivable	$229.00
Creative Inventory	$229.00

VIC 20

VIC1901 VIC AVENGERS	$23.00
VIC1904 SUPERSLOT	$23.00
VIC1906 SUPER ALIEN	$23.00
VIC1907 SUPER LANDER	$23.00
VIC1908 DRAW POKER	$23.00
VIC1909 MIDNIGHT DRIVE	$23.00
Terminal 40 col. exp.	$Call
UnWord	$13.00
Grafix Menagerie	$11.00
VIC PICS	$15.00
Ticker Tape	$13.00
Banner Headliner	$13.00
RS 232	$39.00
VT 106A Recreation Pack A	$44.00
VT107A Home Calculation Pack	$44.00
VT164 Programmable Character/Gamegraphics	$12.00
Household Finance	$27.00
VIC Games	$19.00
VIC Home Inventory	$13.00
VIC Rec/Ed II	$13.00
VL101 Introduction to Computing	$19.00
VL102 Introduction to BASIC Programming	$19.00
VM110 VIC20 Programmers Reference Guide	$15.00

computer mail order

east
800-233-8950

477 East Third Street
Williamsport, PA 17701
(717) 327-9575

CALL TOLL FREE

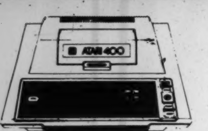
In-stock items shipped same day you call. No risk, no deposit on C.O.D. orders. Pre-paid orders receive free shipping within the continental United States with no waiting period for certified checks or money orders. All prices shown are cash prices add 3% for Mastercard and Visa. NV and PA residents add sales tax. All items subject to availability and price change.

CIRCLE 148 ON READER SERVICE CARD

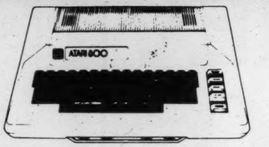
west
800-648-3311

P.O. Box 6689
Stateline, Nevada 89449
(702) 588-5654

computer mail order west



ATARI



400

16K......	$269
32K......	$349
48K......	$429

800 — 48K

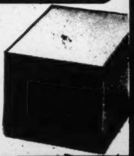
$669

410 Recorder	$ 76.00
810 Disc Drive	$449.00
822 Printer	$269.00
825 Printer	$589.00
830 Modem	$150.00
820 Printer	$259.00
850 Interface	$169.00
CX40 Joystick	$ 18.00
CX853 16K RAM	$ 77.95

Microtek 16K RAM	$ 74.95
Ramdisk (128K)	$429.95
Itec 48K Board	$159.00
Itec 32K	$ 74.00
One Year extended warranty	$ 70.00
481 Entertainer	$ 69.00
482 Educator	$130.00
483 Programmer	$ 49.00
484 Communicator	$344.00

PERCOM

Disk Drives for Atari Computers



Single Drive S1	$649.00
Add-on Drive A1	$349.00
Dual Drive S2	$899.00

μ-SCI

MICRO-SCI

Disk Drives for Franklin & Apple II

A1I	$349.00
A40	$389.00
A70	$519.00
C2	$ 85.00
C47	$ 89.00

HOT ATARI GAMES

PAC-MAN	$35.00
Centipede	$35.00
Caverns of Mars	$32.00
Asteroids	$29.00
Missile Command	$29.00
Star Raiders	$39.00
Ghost Hunter	$24.00

NEW RASTER BLASTER $24

C B S

ROM CARTRIDGE GAMES FOR YOUR ATARI

Krazy Shoot Out	$32.00
K-razy Kritters	$32.00
K-razy Antics	$32.00
K-star patrol	$32.00

STICK STAND

$6.99

ARCADE ACTION FROM YOUR ATARI JOYSTICK

MODEMS

Hayes	
Smart	$239.00
Chronograph	$199.00
Microdem II	$279.00
Microdem 100	$309.00
Novation Auto	
D Cat	$169.00
Cat	$159.00
Anchor	
Mark I (RS-232)	$ 79.00
Mark II (Atari)	$ 79.00
Mark III (TI-99)	$109.00
Mark IV (CBM/PET)	$125.00
Mark V (OSBORNE)	$ 95.00
Mark VI (IBM-PC)	$179.00
Mark VII (Auto Answer/Dial)	$119.00
9 Volt Power Supply	$ 9.00

DATASOFT

Games for the Atari

Pacific Coast Highway	$25.00
Canyon Climber	$25.00
Tumble Bugs	$25.00
Shooting Arcarde	$25.00
Clows and Balloons	$25.00
Graphic Master	$30.00
Graphic Generator	$13.00
Micro Painter	$25.00
Text Wizard	$89.00
Spell Wizard	$64.00
Bishops Square	$25.00

ON-LINE

Jawbreaker	$27.00
Softporn	$27.00
Wizzard and Princess	$29.00
The Next Step	$34.00
Mission Asteroid	$22.00
Mouskattack	$31.00

SYNAPSE

File Manager 800	$79.00
Chicken	$26.00
Dodge Racer	$26.00
Synassembler	$30.00
Page 6	$19.00
Shamus	$26.00
Protector	$26.00
Nautilus	$26.00
Slime	$26.00
Disk Manager	$24.00

MONITORS

AMDEK	
300G	$169.00
Color I	$339.00
Color II	$699.00
Color III	$429.00
BMC	
12" Green	$ 85.00
13" Color 1400	$279.00
13" Color 1401 (Midres)	$369.00
ZENITH	
ZVM121	$99.00
SHARP	
Sharp 13" Color TV	$275

VISICORP

VISICALC	
Apple II +	$189.00
Atari	$189.00
Commodore	$189.00
IBM	$189.00
For APPLE, IBM, FRANKLIN	
Visidex	$189.00
Visifile	$189.00
Visiplot	$159.00
Visiterm	$189.00
Visitrend/Plot	$229.00
Visi Schedule	$229.00
Desktop Plan	$189.00

TIMEX

TIMEX SINCLAIR 1000

LOWEST PRICE EVER

$89.99

Maxell Disks

MD I (Box of 10)	$36.00
MD II (Box of 10)	$46.00
MFD I (8")	$44.00
MFD II (8" Double Density)	$54.00
Syncom (Box of 10)	$29.00

Computer Covers

Atari 400	$6.99
Atari 800	$6.99
Atari 810	$6.99
Commodore VIC-20	$ 6.99
Commodore 8032	$14.99
Commodore 8050/4040	$10.99

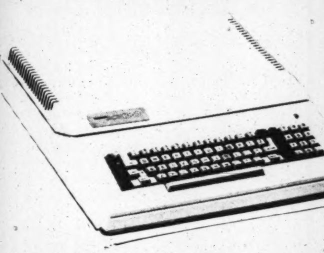
COVERS CONTAIN ADVERTISING

west 800-648-3311

In Nevada
CALL
(702)588-5654

P.O. Box 6689
Stateline,
NV. 89449

FRANKLIN ACE1000



64K Personal Computer

Hardware, software and peripheral compatable with the Apple II and even has some features not found on the Apple.

CBM 8032 $999

Commodore Business Machines

CBM 64	CALL
4032	$ 749.00
8096 Upgrade Kit	$ 369.00
Super Pet	$1599.00
2031	$ 369.00
8250 Double Sided Disk Drive	$1699.00
D9060 5 Megabyte Hard disk	$2399.00
D9090 7.5 Megabyte Hard disk	$2699.00
8050	$1299.00
4040	$ 969.00
8300 (Letter Quality)	$1549.00
8023	$ 599.00
4022	$ 399.00
Pet to IEEE Cable	$ 37.00
IEEE to IEEE CAble	$ 46.00
Tractor Feed for 8300	$ 240.00
New Z-Ram, Adds CP/M and 64K Ram	$ 549.00

The Manager	$209.00
Magis	Call

PROFESSIONAL SOFTWARE

Word Pro 5 +	$319.00
Word Pro 4 +	$299.00
Word Pro 3 +	$199.00
The Administrator	$379.00
InfoPro Plus	$219.00
Power	$ 79.00

HEWLETT PACKARD HP•85 $1969

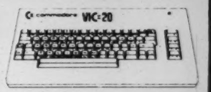
HP•125	$1969.00
BP•85 16K Memory Module	$ 169.00
5¼" Dual Master Disc Drive	$1799.00
Hard Disk w/Floppy	$4349.00
Hard Disk	$3549.00
"Sweet Lips" Plotter	$1199.00
80 Column Printer	$ 649.00

HEWLETT PACKARD HP 41CV CALCULATOR $209

HP 41C	$149.00
HP 10C	$ 69.00
HP 11C	$ 79.00
HP 12C	$114.00
NEW 115C	$119.00
NEW 16C	$125.00

HPIL PERIPHERALS IN STOCK!

VIC 20 $179



VIC 1530 Commodore Datassette	$ 69.00
VIC 1540 Disk Drive	$ 339.00
VIC 1541 (64 Disk Drive)	CALL
VIC 1515 VIC Graphic Printer	$339.00
VIC 1210 3K Memory Expander	$ 32.00
VIC 1110 8K Memory Expander	$ 53.00
16K VIC Expansion	$ 94.00
VIC 1011 RS232C Terminal Interface	$ 43.00
VIC 1112VIC IEEE-488 Interface	$ 86.00
VIC 1211 VIC 20 Super Expander	$ 53.00
VIC Mother Board	$ 99.00

NEC COMPUTERS

8001-A	$749.00
8031	$749.00
8012	$549.00

PRINTERS

8023	$ 549.00
7710/7730	$2399.00
3510/3530	$1599.00

MONITORS

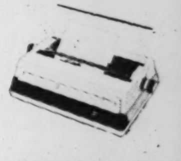
JB-1201	$179.00
JC-1201	$349.00
JC-1202	$899.00

SHARP PC-1500 POCKET COMPUTER

ALSO AVAILABLE:
Printer w/cassette interface
cassette tape recorder
and 4K and 8K RAM EXTENSIONS

PRINTERS Smith-Corona

TP-1 $599



Call for price and information on the new "intelligent" letter quality printer.

C. ITOH (TEC)

Starwriter (F10-40CPS)	$1399.00
Printmaster (F10-55CPS)	$1749.00
Prowriter 80 Col (P)	$ 499.00
Prowriter 80 Col (S)	$ 629.00
Prowriter 2 (132 Col)	$ 799.00

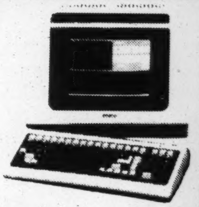
OKIDATA

82A	$ 469.00
83A	$ 689.00
84 Parallel	$1099.00
84 Serial	$1249.00

— ALSO —

Talley 8024-L	$1629.00
IDS Prism	CALL

Televideo Terminals



910	$579
912C	$699
920C	$749
925C	$749
950	$950
802	$ Call
802H	$ Call
816	$ Call
806	$ Call

In-stock items shipped same day you call. No risk, no deposit on C.O.D. orders. Pre-paid orders receive free shipping within the continental United States with no waiting period for certified checks or money orders. Add 3% (minimum $3.00) shipping and handling on all C.O.D. and Credit Card orders. NV and PA residents add sales tax. All items subject to availability and price change. **NOTE:** We stock manufacturer's and third party software for most all computers on the market! Call today for our new catalog.

ADDITIONAL MANUFACTURER'S DISCOUNTS AVAILABLE TO QUALIFIED EDUCATIONAL INSTITUTIONS

800-233-8950 east

477 E.
THIRD ST.
Williamsport
PA 17701

IN PA
CALL
(717)327 9575

CIRCLE 148 ON READER SERVICE CARD

computer mail order east

Searching Techniques

Part 4

Edward Mitchell

A Survey of Sorts

Steve glanced at the display screen of his computer. "Drat!" he exclaimed, "it still isn't finished. That program has been running over an hour, and it still isn't done."

Linda looked up from her desk. "What algorithm are you using?" she asked.

"Just a sort routine I learned in a beginning programming class. Why?" he answered.

"Because maybe you're not using the right one."

"You mean there is more than one way to sort?" Steve blurted out.

"Yeah, there are lots more than just one. Let me see your listing."

Steve handed her a tattered piece of paper, well worn by pencil marked changes. Linda pulled her chair over near his computer and reached for the listing. She recognized it as a typical Bubble Sort, easy to understand, but very inefficient.

"Look," she said, as she drew some lines on a piece of paper. "This steep curve represents your Bubble Sort," she said, pointing to one of the lines. "When the size of your table gets really big, the time it takes to do the sort is huge. But look at this curve down here."

Steve looked, rather skeptically at the other curve. It ran across the paper near the bottom of the graph, increasing only gradually.

"This curve represents Quicksort," said Linda. "Compared to your Bubble Sort, look at how little time it takes. And look at how little the time increases as the table gets bigger."

"Wow!" said Steve. "For my file that would be about 50 times faster. How does Quicksort do it?"

"Looks like your program just finished," responded Linda. "I have some other things I need to work on right now, but maybe I could help you later today."

Steve sighed, feeling mildly perturbed. He finally had a chance but now he would have to postpone it 'til later. Hopefully, they could get things sorted out.

A surprisingly large number of techniques are available to sort data with a computer. The obvious techniques can be very slow when used to sort a large number of records. Better methods such as Shellsort and Quicksort that sort at much higher speeds than the ubiquitous Bubble Sort have been discovered.

As mentioned in the introduction to Part 1, when a problem becomes too large for the computer, we may choose to buy a bigger computer, or we may choose to find a faster method of solving the problem. Several sorting methods run very fast and are not very difficult to program. Their approach to sorting is just not very obvious. Before studying Shellsort and Quicksort, we shall first look at some of the simpler sorts, such as the Bubble, Selection, and Insertion sorts.

Measuring Sort Performance

Because there are so many sorting algorithms, it is apparent that some techniques are better than others. But how much better? By analyzing parameters associated with each algorithm, such as the total number of comparisons and exchanges expected for a list of size n, a simple formula may be derived to indicate the speed of a sort. For example, the Bubble Sort requires on the order of n^2 time to sort a list of n numbers. This means that the time is roughly equal to the size of the list, squared. Doubling the size of n quadruples the length of time to perform the sort (e.g. when $n=5$, then $n^2=25$, but when $n=10$, then $n^2=100$, or $100/25$ — four times longer).

Another way to compare sort performance is to time the sorting algorithms as they sort different sized arrays of data. The resulting times can be plotted against n to give an intuitive notion of their relative speed. Figure 1 presents graphs for four of the sorting methods discussed in this article, comparing the sorting time required by these algorithms.

Edward Mitchell, 720-A Independence Ave., Mountain View, CA 94040.

SYSTEMS IV
P.O. BOX 2633
PEACHTREE CITY, GA 30269

FREE!
DISK DRIVE
FRANKLIN ACE1000

- Apple II compatible
- 64K of RAM
- Upper and lower case
- Typewriter-style keyboard
- 12-key numeric pad
- Alpha lock key
- VisiCalc keys
- 50-watt power supply
- Built-in fan

PACKAGE PRICE

• ACE 1000	$1690	$1595
• DISK DRIVE		N/C
• CONTROLLER CARD		95

SOFTWARE

Applied Software Technology	
Versaform	$291.75
Art-Sci./Softape	
Magic Window	$74.95
Basic Mailer	52.49
Magic Spell	52.49
Avant Garde	
Hi-Res Golf	$22.50
Hi-Res Secrets	94.95
Zero-Gravity Pinball	22.50
Sentence Diagramming	18.75
Broderbund	
Galactic Empire	$18.75
Apple Panic	22.50
Payroll	296.25
General Ledger	371.25
Budgeco	
Raster Blaster	$22.50
California Pacific	
Budge's 3D Graphics	$29.95
Continental Software	
General Ledger	$188.75
Accounts Receivable	188.75
Accounts Payable	188.75
Payroll	188.75
Property Management	371.25
Home Accountant	56.50
Guardian	22.50
First Class Mail	56.50
Dakin 5	
Rings of Saturn	$29.95
Depreciation Planner	295.00
Budget Planner	111.50
Bus. Bookkeeping Sys.	295.00
Datamost	
Thief	$22.50
Snack-Attack	22.50
Tax Beater	97.50
Real Estate Anal. Program	97.50
Edu-Ware	
Algebra I	$29.95
Compu-Math: Arithmetic	37.50
Compu-Math: Fractions	29.95
Compu-Math: Decimals	29.95
Spelling Bee	29.95
Perception (3.0)	18.75
Algebra II	29.95
Howard Software	
Creative Financing	$146.75
Real Estate Analyzer	146.75
Tax Preparer	112.50
Innovative Design	
Pool 1.5	$24.95
Shuffleboard	22.50
Trick Shot	29.95
IUS	
Easy Writer	$75.00
Easy Mailer	52.50
Date Dex	112.50
L&S Computerware	
Crossword Magic	$37.95
L.J.K. Enterprises	
Letter Perfect	$112.50
Data Perfect	75.00
Mesa Research	
Investment Decisions	$75.00
Micro Lab	
Dog Fight	$22.50
The Learning System	112.50
The Invoice Factory	150.00
Tax Manager	112.50
Asset Manager	150.00
Visifactory	56.95
Visiblend	37.50
Roach Hotel	24.95
Data Factory (5.0)	225.00
Muse	
Super-Text 40/80	$135.00
Form Letter Module	75.00
Castle Wolfenstein	22.50
Three Mile Island	29.95
ABM	18.75
Data Plot	43.95
Elementary Math	29.95
On-Line Systems	
Hi Res #1: Mystery House	$18.75
Hi Res #2: Wizard and Princess	24.95
Hi Res #3: Cranston Manor	29.95
Hi Res #4: Ulysses	29.95
Hi Res Football	29.95
Screen Writer II	97.50
Hi Res Soccer	22.95
The General Manager	112.50
Time Zone	75.00
Memory Management System	37.50
The Dictionary	75.00
Frogger	24.95
Screen Writer Pro	150.00
Silicon Valley	
Word Handler	$188.00
List Handler	60.00
Appointment Handler	29.95
Sirius Software	
E-Z Draw (3,3)	$37.50
Space Eggs	22.50
Gamma Goblins	22.50
Gorgon	29.95
Sneakers	22.50
Beer Run	22.50
Computer Football	22.95
Fly Wars	22.95
Penguin Software	
Complete Graphics II	$60.00
3D Drawing System	24.95
100 Color Drawing System	24.95
Special Effects	29.95
The Graphics Magician	45.00
Additional Fonts & Sets	15.00
Magic Paintbrush	22.95
Complete Graphics (TABLET VER.)	90.00
Special Effects (TABLET VER.)	60.00
Personal Business Systems	
Executive Secretary	$188.00
The Executive Speller	60.00
Piccadilliy Software	
Warp Destroyer	$22.95
Star Blaster	22.95
Professional Software Tech	
Executive Briefing System	$150.00
Sir-Tech	
Wizardry	$37.50
Software Publishing Corp.	
PFS	$93.95
PFS REPORT	60.00
PFS Graph	93.95
Southwestern Data	
Apple Doc	$37.50
The Correspondent	45.00
Apple II Utility Pack	14.95
ASCII Express	60.00
On-Line Dial Up	75.00
Norad	29.95
Stoneware	
D. B. Master	$175.00
Strategic Simulations	
Computer Bismark	$45.00
Warp Factor	29.95
Computer Baseball	29.95
Synergistic Software	
Program Line Editor	$29.95
The Data Reporter	165.95
The Directory Manager	22.95
Planetary Guide	22.95
Game Animation Package	37.50
Global Program Line Editor	45.00
U S A Software	
Supercram	$135.00
Request	169.95
3D Supergraphics	29.95
Micro Pro	
Wordstar	$250.00
Spellstar	125.00
Mailmerge	78.95
Datastar	175.00
Supersort	125.00
Calcstar	175.00

DISK DRIVES

Franklin	$549.00
M-SCI A-2	400.00
M-SCI A-40	395.00
M-SCI A-70	535.00
Controller Card	99.00

PRINTERS

Okidata	
80	$375.00
82A	560.00
84P	1,195.00
84S	1,295.00
Bytewriter	**$995.00**
Transtar	
Daisywheel	$1,395.00

MONITORS

BMC	
12" green phos.	$99.00
Amdek	
12" B & W	$135.00
12" green phos.	175.00

ACCESSORIES

Microtek	
16K RAM BD	$110.00
Para. inter	100.00
Videx	
Video term	$295.00
Enhance II	125.00
Orange	
Grappler plus	$145.00
ALS	
Z Card	$245.00
Smart term	295.00
Mt. Hdwe.	
CPS Card	$175.00
TG Joy Stick	49.00
Prometheus	
Versa Card	$189.00

1-800-227-3800 / Ext. 431

Ga. Residents Add 4% Tax

CIRCLE 349 ON READER SERVICE CARD

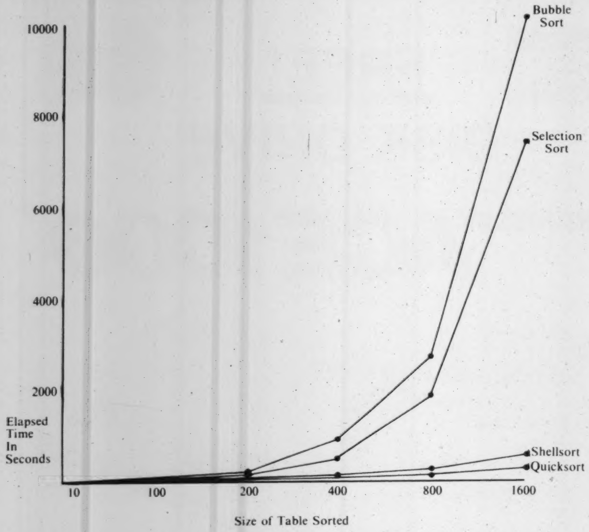


Figure 1. A comparison of running time versus table size for four sorting algorithms. Bubble Sort takes over 10,000 seconds to sort 1600 numbers, while Quicksort takes about 350 seconds.

Figure 1. Data Points.

n =	Quicksort	Shellsort	Selection	Bubble
10	1 sec.	1	1	1
100	16	15	34	46
200	36	38	127	176
400	75	90	490	677
800	161	221	1925	2667
1600	348	530	7365*	10,130*

*Estimated Data Point

Keep in mind that when the data records are almost ordered, the sort algorithms may behave much differently than expected, running either much faster or much slower. A sorting technique called Heapsort, has the interesting property that its average and worst case sorting times are nearly the same. Heapsort is not described in this article, but see references Knuth (1973) or Standish (1980).

Of course, how fast the sorting routine operates may be irrelevant, simply because the computer functions so quickly as to make differences in sorting times unnoticeable. In other cases, it may be just fine to let the computer run overnight, in which case it does not matter if the sort is done in one hour or eight hours. It is important to recognize that the difference in sorting performance becomes a factor only as n becomes large, and then only when the time, in human terms, becomes significant.

Extended BASIC **TRS-80 Color Computer**

The Champagne of Software For a Beer Budget!

Over 75 quality programs a year for under 75¢ each!

Ah, **CHROMASETTE** Magazine, the toast of the holiday season . . . and any season! A subscription to **CHROMASETTE** Magazine consists of 6 to 8 premium programs ON CASSETTE, delivered by First Class Mail to you and your computer every month! Tutorials, utilities, games, and practical programs to usher in a great new computing year!

So, celebrate and get a subscription to **CHROMASETTE** Magazine! Or just take a little sip and try a back issue.

The Bottom Line:

1 year (12 issues)	$45.00	Calif. residents add 6% to single copies.
6 months (6 issues)	$25.00	North America — First Class postage included.
Single Copies	$ 5.00	Overseas — add $10 to subscriptions and $1 to single copies. Sent AO rate.

MasterCard/Visa

The Fine Print:
All issues from July 1981 available — ask for list. Programs are for the Extended BASIC model and occasionally for disks.

Chromasette Magazine P.O. Box 1087 Santa Barbara, CA 93102 (805) 963-1066

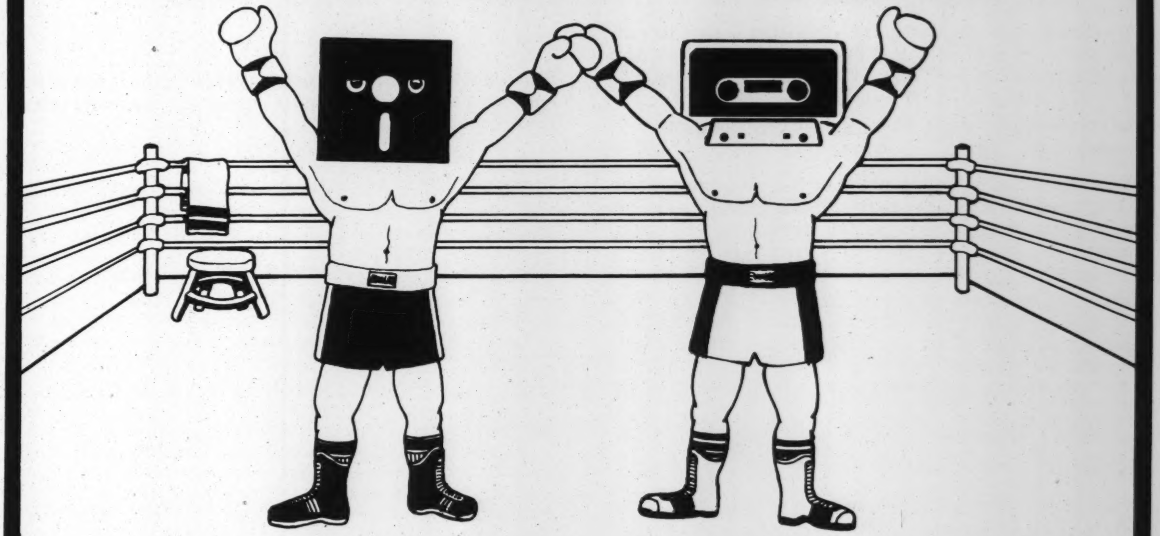
CIRCLE 138 ON READER SERVICE CARD

TRS-80 Model I

And In This Corner, Another Champion.......

TRS-80 Model III

CLOAD'S DISK VERSION!



Get 12 tapes OR disks a year containing over 75 quality programs — without knocking out your budget!

We finally gave in . . . After over FOUR years of publishing some of the best (aren't we pompous), useful and fun programs on tape, we are now offering **CLOAD Magazine on disk,** too!

A subscription to **CLOAD Magazine** (tape or disk) consists of 6 to 8 ready-to-load programs delivered by First Class Mail every month. What a winner!

Fight high software prices — Get a subscription to **CLOAD Magazine.** Or just throw a single punch and try a back issue . . .

The Bottom Line:

	Tape	Disk
1 year (12 issues)	$50.00	$95.00
6 months (6 issues)	$30.00	$55.00
Single Copies		
Back Issues	$ 6.00	$11.00
Good Games #1	$12.00	$23.00
Adventures #1	$13.00	$24.00

California residents add 6% to single copies.
North America — First Class postage included
Overseas — add $10 to subscriptions and $1 to single copies. Sent AO rate.

CLOAD
MAGAZINE
INC.

(805) 962-6271

P.O. Box 1448
Santa Barbara, CA
93102

MasterCard/Visa

The Fine Print:

All issues from Oct 78 available on tape. Issues from Oct 82 available on disk, also. Ask for list (24 Level I issues also available).

CIRCLE 140 ON READER SERVICE CARD

The Selection Sort

Selection sort is the first sort to be shown in detail. To sort the following array into ascending order,

S1(1)	S1(2)	S1(3)	S1(4)	S1(5)	S1(6)
7	11	12	3	31	9

the selection sort algorithm starts at the left and scans the list, looking for the lowest number. It finds the lowest value at position S1(4)=3. The number 3 is printed, and S1(4) is set to some large number, giving

S1(1)	S1(2)	S1(3)	S1(4)	S1(5)	S1(6)
7	11	12	99999	31	9

By setting S1(4) to 99999, the algorithm is sure to not select the number at S1(4) again. It then repeats the scan, this time choosing 7 at S1(1). The number 7 is printed, and S1(1) is set to a large number.

S1(1)	S1(2)	S1(3)	S1(4)	S1(5)	S1(6)
99999	11	12	99999	31	9

The algorithm loops through the list repeatedly until all the values in S1() are set to the same large value. A simple selection sort might be programmed as shown in Listing 1.

Listing 1. The simple Selection Sort.

```
1000 FOR I = 1 TO N
1010 S = 999999!
1020 FOR J = 1 TO N
1030    IF S1 (J) < S THEN S = S1 (J): L = J
1040 NEXT J
1050 PRINT S1 (L),
1060 S1 (L) = 999999!
1070 NEXT I
1080 RETURN
```

By making a simple change to Listing 1, a second array containing the sorted numbers is produced. By removing lines 1050 and 1060, and adding the line,

1050 S2(I) = S1(J)

Listing 1 will take as input array S1() and produce a second array S2(), containing the sorted list. For large values of n, two arrays will use a great deal of memory.

An improvement can be made so that the second array is not needed. To illustrate, consider the list of numbers,

7	11	12	3	31	9
↑			↑		
(a)			(b)		

"How do you suppose we managed to get such a good deal on these new terminals?"

The arrow at (a) points to the start of the scan. Moving across the list, the algorithm chooses 3 at (b). Rather than printing 3 and setting the corresponding element of the list to 99999, the number is simply exchanged with the number at the start of the list to give,

3	11	12	7	31	9
↑	↑		↑		
(a)	(c)		(b)		

The number at (a) is the lowest number in the list, so the scan now begins at (c). Since 7, at (b), is the lowest number, (b) and (c) are exchanged to give,

3	7	12	11	31	9
↑	↑		↑		
(a)	(c)		(b)		

The selection sort continues in that manner until the entire list is sorted. Listing 2 shows the improved selection sort routine.

Listing 2. The improved Selection Sort.

```
1000 FOR I = 1 TO N
1010 S = 999999!
1020 FOR J = I TO N
1030    IF S1 (J) < S THEN S = S1 (J): L = J
1040 NEXT J
1050 T = S1 (I)
1060 S1 (I) = S1(L)
1070 S1 (L) = T
1080 NEXT I
1090 RETURN
```

Bubble Sort

The Bubble Sort scans the list until finding any number that is lower than the first, not necessarily the lowest overall. Once a number is found, the two values are exchanged, and the algorithm continues searching. For example, using

(1)	(2)	(3)	(4)	(5)	(6)
9	11	12	7	31	3

the scan begins at (1) and compares 9 to the other numbers. As soon as 7 at (4) is found, the two numbers are exchanged.

(1)	(2)	(3)	(4)	(5)	(6)
7	11	12	9	31	3

Resuming at (5), the algorithm scans to (6), where 3 is found to be less than 7. The two numbers are exchanged, giving

(1)	(2)	(3)	(4)	(5)	(6)
3	11	12	9	31	7

At this point the first number in the list is the lowest number. The algorithm begins a second pass at (2), scanning until (4), where an exchange produces,

(1)	(2)	(3)	(4)	(5)	(6)
3	9	12	11	31	7

Finally, (2) is compared to (6) and the two values are exchanged.

(1)	(2)	(3)	(4)	(5)	(6)
3	7	12	11	31	9

Now the first two numbers of the list are in sorted order. Beginning at (3), the Bubble Sort continues to scan the list until all of the numbers are in ascending order. The name Bubble Sort comes from the appearance of the lowest numbers as they percolate or "Bubble" to the front of the list. A Basic program to perform a Bubble Sort is shown in Listing 3.

Listing 3. The Bubble Sort.

```
1000 FOR I = 1 TO N - 1
1010 FOR J = I TO N
1020     IF S1 (J) < S1 (I) THEN T = S1 (J): S1(J) =
         S1 (I): S1(I) = T
1030 NEXT J
1040 NEXT I
1050 RETURN
```

Insertion Sorts

The ordered table binary search from Part 1 is an insertion sort. The ordered table keeps the names in alphabetical order. A new name is added by finding the position at which it should be placed, and then inserting it into the list. To add 13 and 8 into the list,

3 7 9 11 31

just insert each number at the appropriate position. This gives,

3 7 ^ 9 11 ^ 31
8 13

An insertion sort removes one number from the input and inserts it into the sorted output list.

Algorithms 2 and 3, and Listing 2 in Part 1, and Listing 3 in Part 3 of this series illustrate the insertion sort technique using an array of character strings. The same algorithms may be applied to arrays of numbers by changing the string variables to numeric variables.

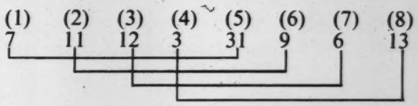
The insertion sort does not require that any particular data structure or search technique be used. Depending on the requirements of the data, an array, binary tree, or linked list may be used to represent the data, and a sequential, binary or binary tree search may find the position at which to insert the new name.

Shellsort

The Shellsort, named for its creator, Donald Shell, divides the list into a large number of small partitions. The numbers within each partition are then sorted into order. For example, if we start with the list,

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
7	11	12	3	31	9	6	13

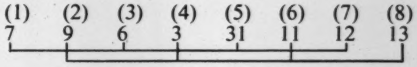
and partition it into pairs of elements, we get the list,



(1) is paired with (5), (2) with (6), (3) with (7) and (4) with (8). For each pair, the two elements are arranged into order. Exchanging (2) and (6), and (3) and (7) produces the list,

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
7	9	6	3	31	11	12	13

Next, the partitions are doubled in size so that each contains four elements, giving



The four elements within each of these partitions are sorted to give,

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
6	3	7	9	12	11	31	13

Finally, the partitions are doubled again, this time to encompass the entire list. Before sorting the final partition, note that the list is almost sorted. The first four elements, while in the wrong positions are indeed the first four elements of the sorted list. The final list shown below is produced by interchanging 3 adjacent pairs of numbers at locations (1) and (2), (5) and (6), and (7) and (8).

3 6 7 9 11 12 13 31

The Shellsort is shown as a Basic program in Listing 4. The variable D is the distance between elements within a single partition. Statement 1050 selects the partition to sort, while statements 1060 through 1110 sort the elements of the partition.

Listing 4. The Shell Sort. This is essentially Algorithm 201 "Shell Sort" from the Collected Algorithms of the CACM.

```
1000 D=4
1010 IF D< N THEN D = D + D:GOTO 1010
1020 D = D - 1
1030 D = INT (D/2)
1040 IF D < 1 THEN RETURN
1050 FOR J = 1 TO N - D
1060   FOR I = J TO 1 STEP -D
1070      IF S1(I + D) > S1(I) THEN GOTO 1120
1080      T= S1(I)
1090      S1(I) = S1(I + D)
1100      S1(I + D) = T
1110   NEXT I
1120 NEXT J
1130 GOTO 1030
```

Quicksort

The Bubble Sort algorithm requires n^2 time to sort a list of n entries. If the list is split in two, the problem becomes one of sorting two smaller lists, each taking $(1/2n)^2$ time. If n = 10, then Bubble Sort takes $n^2 = 100$ time to sort the list. Dividing the list into two smaller lists of n=5 gives a sorting time of $5^2 + 5^2 = 50$, which is less than the original (neglecting the problem of merging the two sorted lists together after the sort).

The Quicksort algorithm, invented by C.A.R. Hoare, uses a divide and conquer approach to divide the list into successively smaller subproblems. To divide the list, a number called the pivot value is chosen. All numbers less

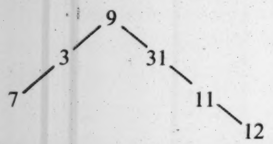
U.S POST OFFICE
SANTA
LETTERS TO SANTA
Campbell

"He can't fool me with all this generosity. He makes it all back selling his computerized mailing list..."

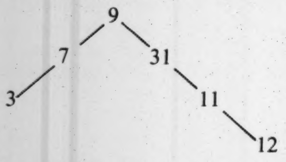
than the pivot are placed to the left and all numbers greater than the pivot are placed to the right. To sort the list of six numbers,

```
9     31     11     7     12     3
```

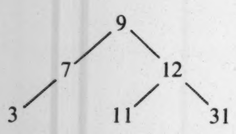
we choose the first number in the list, 9, as the pivot value. All the numbers less than 9 are arranged to the left of the pivot value and all the numbers that are greater are arranged to the right, giving two partitions. Using a tree to graphically depict the operation of Quicksort, the partitioning is easily observed,



The first partitioning produces two new partitions. Each of these partitions becomes a new subproblem to be subdivided further. Since there are just two numbers in the left subbranch, they are easily sorted to give,



The next step is to select a pivot point for the right subbranch and partition it in two sections. Choosing 12 as the pivot value, the right branch is partitioned into,



After only three partitions, the list is sorted into the tree shown above. Traversing the tree from left to right yields the sorted list.

Selecting the Pivot Value

Several modifications have been made to Quicksort, particularly with respect to the selection of the pivot value. Ideally, the pivot should be equal to the median of the list, so that it yields two nearly equal partitions. One simple selection is to choose the first value in the list as the pivot point. Unfortunately, if the list is nearly sorted, which is often the case, that choice is a poor selection since it will probably be the lowest number in the list. Attempting to partition on that value will have no effect since all numbers greater than it are already to its right.

Another candidate is the last value in the list, but for similar reasons, it may be a very poor choice when the list is almost sorted. If the list is expected to be almost sorted, then choosing the middle entry as a pivot would be a good choice. Other choices include averaging the first, last and middle elements of a partition or averaging a random sample from the list.

Programming Quicksort

Rather than using a tree structure for Quicksort, it is much faster and easier to use an array based version, especially when coding in a language like Basic. Let the numbers

```
9     31     11     7     12     3
```

be contiguous numbers in an array. To partition the array, select 9 as the pivot value and reorder the array as,

```
9     3     7          11     12     31
         <9             >9
```

The first three numbers are all less than or equal to the pivot, 9, and the last three numbers are all greater.

To perform an array based partitioning, create two pointers I and J, and set them as shown below.

```
9     31     11     7     12     3
I                                J
```

Let X have the pivot value of 9. Advance I to the right until finding a number greater than the pivot, X. This yields,

```
9     31     11     7     12     3
      I                          J
```

Next, decrement J to the left until finding a number less than the pivot. In this case, 3 is less than 9, so J does not need to move. Exchange the two numbers pointed to by I and J, giving,

```
9     3     11     7     12     31
      I                         J
```

Repeat the procedure, advancing I to the right. Then decrement J to the left until reaching a number less than 9.

```
9     3     11     7     12     31
            I      J
```

The two numbers are exchanged and the first partition is completed, giving two new partitions,

```
9     3     7          11     12     31
            I          J
```

All numbers at or to the left of I are less than or equal to 9, and those to the right are greater. It is now up to the Quick Sort algorithm to sort the two smaller sections. The easiest way to do that is to have Quick Sort call itself to partition and sort each of the two smaller sections.

Quicksort is shown in Algorithm 1. After the first partitioning, Quicksort will call itself recursively to sort the two smaller sections. Unfortunately, with a Basic program, the solution can not be quite that simple. For example, the Quicksort subroutine sorts the numbers between L and R, but as soon as Quicksort is called again, the old values of L, R, I, and J will be lost when set to the edges of the new partition. Obviously, the values need to be saved before calling Quicksort. An initial solution

Algorithm 1

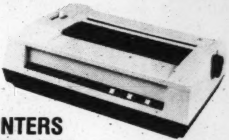
Quicksort (L,R)

On entry L is the lower bound of a partition and R is an upper bound. This algorithm sorts the numbers in the array S1() between L and R. The partitioning routine is described in the text and shown in Listing 5.

```
Step   Action
  1) Partition (L,I,J.R)
  2) IF R-L=1 Then
       IF S1(R)   S1(L) Then Exchange S1(R), S1(6)

     Else
       Quicksort (L,I)
       Quicksort (J,R)
```

FOR YOUR APPLE II

Industry standard products at super saver discount prices



PARALLEL PRINTERS
NEC 8023 or C-ITOH 8510

(Virtually identical) Specifications: • 100 CPS dot matrix printer • 80 column print–136 characters per line • Tractor/friction feed • 7 different print fonts included • 2K printer buffer • Proportional spacing • Bit image graphics and graphic symbols.

NEC 8023 or C-ITOH	**$495**
NEC 8023 or C-ITOH 8510 with Parallel Interface and Cable	**$550**
EPSON 100 with Parallel Interface and Cable	**$749**

Z-80 CARD FOR YOUR APPLE
MICROSOFT SOFTCARD

With CP/M* and MBASIC.

(List: $399) **$289**

NEW!

Best Buy!!!

ADVANCED LOGIC SYSTEM Z-CARD With C-PM*

Has everything the Softcard has except MBASIC. Works with Microsoft's disks too.

(List $269) ...... **Special at $195**

NEW!

ALS SYNERGIZER

CP/M* operating package with an 80 column video board, CP/M* interface, and 16K memory expansion for Apple II. Permits use of the full range of CP/M* software on Apple II. Includes SuperCALC.

(List: $749) **$549**

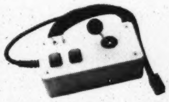
NEW!

U-Z-80 PROCESSOR BOARD (From Europe)

Software compatible with Softcard and ALS Software **$149**

MICROSOFT + PREMIUM SYSTEM

Includes Videx Videoterm, Softswitch, Microsoft and Softcard, Microsoft and Z-80 Card, and Osborn CP/M* Manual **$595**



JOYSTICK

Takes the place of two Apple Paddle Controllers.

From BMP Enterprises. Heavy duty industrial construction and cable. Non-self centering. With polarity switches for consistent motion control.

(List: $59) **$39**

MONITORS FOR YOUR APPLE

AMDEK 300G (18MHZ Anti-Glare Screen)	**$179**
NEC 12" HIRES GREEN	**$179**

SUPER SPECIAL!

SPECIAL 12" GREEN MONITOR	**$99**

SPECIAL AND NEW

5 MEGABYTE HARD DISK

For Apple II. Supplied with controller. Use with CP/M, Apple DOS, & Apple Pascal **$1995**

5¼" DISK DRIVE

Use with standard Apple II disk controller. . **$295**

5¼" FLOPPY DISKS

With hub rings. Box of 10.

With other purchase	**$19.95**
Without purchase	**$23.00**

16K MEMORY EXPANSION MODULE

The preferred 16K RAM Expansion Module from PROMETHEUS. Fully compatible with CP/M* and Apple Pascal*. With full 1-year parts and labor warranty. (List: $169) **$75**

WORD PROCESSING SPECIAL WITH WORDSTAR AND SUPERCALC!

Do professional word processing on your APPLE. All necessary hardware and software included. Complete 80 column video display, enhanced character set, 16K memory board, Z-Card with CP/M* software, Wordstar and word processing software and SuperCALC.

(List: $1,128) .... **Special at $695**

NEW!

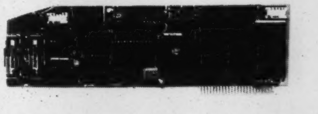
from Prometheus! **ExpandaRAM**

The only 128K RAM card that lets you start with 16K, 32K, or 64K of memory now and expand to the full 128K later. Fully compatible with Apple Pascal, CP/M*, and Visacalc. No Apple modification required. Memory management system included with all ExpandaRAMs. Disk emulators included with 64K and 128K versions.

MEM-32 Two rows of 16K RAMS make a 32K RAM Card	**$209**
MEM-64 One row of 64K RAM. With DOS 3.3 disk emulator	**$299**
MEM-128 Two rows of 64K RAMS installed make a 128K Card. With DOS 3.3 disk emulator	**$399**
MEM-RKT 64K RAM Add-On-Kits–64K Dynamic RAMS. Each	**$125**
VISICALC Expansion Program for MEM-128	**$75**
MEM-PSL Pascal disk emulator for MEM-128	**$45**

MODEMS FOR YOUR APPLE II

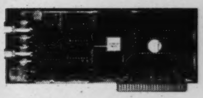
HAYES Smartmodem	**$229**
MICROMODEM II	**$279**



VERSAcard FROM PROMETHEUS

Four cards on one! With true simultaneous operation. Includes: (1) Serial Input/Output Interface, (2) Parallel Output Interface, (3) Precision Clock/Calendar, and (4) BSR Control. All on one card. Fully compatible with CP/M* and Apple Pascal*.

(List: $249) **$169**



80 COLUMN VIDEO DISPLAYS FOR APPLE II
SMARTERM

(Not to be confused with SUPRTERM)

Software switching from 80 to 40 and 40 to 80 characters. 9 new characters not found on the Apple keyboard. Fully compatible with CP/M* and Apple PASCAL*. With lowest power consumption of only 2.5 watts.

(List: $345) **$225**

SMARTERM EXPANDED CHARACTER SET

7" x 11" matrix with true decenders. Add to above **$40**

Best Buy! **Combination SMARTERM and EXPANDED CHARACTER SET**

Special at	**$260**
VIDEX, VIDEOTERM	**$249**
VIDEX ENHANCER II	**$119**

NEW!

CENTRONICS COMPATIBLE PARALLEL INTERFACE

From PROMETHEUS. For use with Epson, NEC, C-ITOH, and other printers. Fully compatible with CP/M* and Apple Pascal*.

PRT-1, Only **$69**

GRAPHITTI CARD

Prints HIRES page 1 or 2 from onboard firmware. Features: True 1:1 aspect ratio, prints emphasized mode, reverse mode, rotates 90 degrees . . . plus more. Compare all this with the Grappler. We think you'll agree that this is the best graphics card on the market. Specify for use with EPSON, NEC-8023, C-ITOH Prowriter, or Okidata.

(List: $125) **$89**

SOFTWARE

WORDSTAR	**Special at $195**
SPELLSTAR	**$125**
SUPERCALC	**$175**
D BASE II	**$525**
VISICALC	**$149**
DB MASTER	**$189**

All equipment shipped factory fresh. Manufacturers' warranties included. Please add $3.00 per product for shipping and handling. California: add 6% tax; BART Counties: 6½%.

All items are normally in stock

Phone for Quick Shipment!

(415) 490-3420

. . . And we'll be here to help after you receive your order. Feel free to call the SGC Technical Staff for assistance.

SGC

The mail order specialists

342 Quartz Circle, Livermore, CA 94550

CIRCLE 309 ON READER SERVICE CARD

```
1000 REM - QUICKSORT
1010 IF L >= R - 1 THEN GOTO 1160
1020 REM - SUBR 2000 PARTITIONS THE SEGMENT BETWEEN L AND R
1030 GOSUB 2000
1040 IF J > R THEN GOTO 1170
1050 P = P + 2 : REM - PUSH J AND R ON TO STACK'
1060 S (P) = J: S (P-1) = R
1070 R = I
1080 REM - CALL QUICKSORT TO SORT THE SEGMENT BETWEEN L AND I (R NOW EQUALS I)
1090 GOSUB 1000
1100 L = S (P): REM - RESTORE L = J AND R FROM THE SAVED VALUES ON STACK
1110 R = S (P - 1)
1120 GOSUB 1000
1130 REM - POP THE SAVED DATA FROM THE STACK
1140 P = P - 2: RETURN
1150 REM - IF ONLY 2 ELEMENTS THEN PERFORM QUICK COMPARISION SORT
1160 IF R - L = 1 THEN IF S1(R) < S1(L) THEN T = S1(L): S1(L) = S1(R): S1(R) =T
1170 RETURN
2000 REM
2010 REM
2020 REM
2030 REM
2040 REM - PARTITION THE SEGMENT BETWEEN L AND R, RETURNING I AND J
2050 I = L: J = R
2060 X = (S1(I) + S1(J) + S1((I + J)/2))/3: REM - COMPUTE PIVOT VALUE
2070 REM - INCREMENT I UNTIL FINDING AN S1(I) > THAN X
2080 IF I > N THEN GOTO 2170
2090 IF S1(I) < X THEN I = I + 1: GOTO 2080
2100 REM
2110 REM - DECREMENT J UNTIL FINDING AN S1(J) < THAN X
2120 IF J < M THEN GOTO 2170
2130 IF S1(J) > X THEN J = J - 1: GOTO 2120
2140 REM
2150 REM - IF NEEDED, THEN EXCHANGE THE VALUES AT S1(I) AND S1(J)
2160 IF I < J THEN T = S1(I): S1(I) = S1(J): S1(J) = T: I = I + 1: J = J - 1: GO
TO 2080
2170 I = J: J = J + 1: REM - RETURN I AND J AT EDGES OF PARTITIONS
2180 RETURN
```

*Listing 5. Quicksort. To use Quicksort, set L=1, and R=n (the number of elements in the table to sort) and do a GOSUB 1000. Array S() may be defined as DIM S (2*n), and used as a stack to store the edges of subproblems still to be solved.*

might be to write something like,

```
R1 = R
J1 = J
```

as a way of saving the values of R and J. But what happens if the call to Quicksort, in turn, causes another call to Quick Sort? Ultimately, R1 and J1 will be set to some other values.

The solution is to store R and J on a stack. Each time Quicksort is called, R and J are pushed. For example, to sort the original list, L and R are 1 and 6, respectively. After calling the partitioning routines, two new partitions are created: 1 to 3, and 4 to 6. Quicksort is called recursively to sort each of the two subproblems. The necessary values are placed on the stack, and Quicksort is called. On return, the original values are restored from the stack.

A Basic implementation of Quicksort is shown in Listing 5. The size of the stack S() can be reduced by calling Quicksort to sort the smaller of the two intervals first. This trick is described further in Standish (1980).

Sorting Strings and Files

All of the examples shown so far sort arrays of numbers, but they can also be used with arrays of character strings and with records in disk files. By changing the appropriate variables, the Bubble Sort shown in Listing 2 is altered to sort character strings (see Listing 6(a)).

Unfortunately, sorting character strings is very inefficient because entire strings must be shifted around in memory. Microcomputers (and most large computers, too) do not perform that operation very well. But we don't have to move the strings around. Instead, an array of pointers or indexes is used to point to each name in the array to be sorted. (See Part 2 for an explanation of pointers). Then the pointers are exchanged, rather than the strings. An example makes this clear. Let D$() be the array of names,

D$(1)	D$(2)	D$(3)	D$(4)	D$(5)
LISA	ALAN	GEORGE	TED	ALICE

Let P() be an array of pointers, initially set as,

P(1)	P(2)	P(3)	P(4)	P(5)
1	2	3	4	5

Now, to sort the list of names, exchange the pointer locations as shown,

P(1)	P(2)	P(3)	P(4)	P(5)
2	5	3	1	4

After the sort, D$() is unchanged, only the P() values have been exchanged. Note that D$(P(1))=ALAN, which is the first name in the sorted list and D$(P(2))=ALICE, which is the second name. Verify for yourself that D$(P(I)), for I equals 1 to 5, does, indeed, yield the sorted list of names. A Bubble Sort using pointers is shown in Listing 6(b). Not shown is the initialization of each of the P(I) values to I, for I equals 1 to N, which is accomplished with a single FOR-NEXT loop. The same technique may be applied to all of the string sorts and as a means of improving the execution time of Algorithms 2 and 3 in Part 1 of this series.

Pointers should be used when sorting records in a data file. Rather than reading a record from the file and then exchanging it with another record elsewhere in the

H & E COMPUTRONICS INC.

• • EVERYTHING FOR YOUR TRS-80™ • ATARI™ • APPLE™ • PET™ • CP/M™ • XEROX™ • IBM™ • OSBORNE™ • •

* TRS-80 is a trademark of the Radio Shack Division of Tandy Corp. · * ATARI is a trademark of Atari Inc. · *APPLE is a trademark of Apple Corp. · * PET is a trademark of Commodore
* CP/M is a trademark of Digital Research · *XEROX is a trademark of Xerox Corp. · * IBM is a trademark of IBM Corp. · * OSBORNE is a trademark of Osborne Corp.

NEW

★ All orders processed within 24-Hours
★ 30-Day money back guarantee

BUSINESS PAC 100

100 Ready-To-Run Business Programs

(ON CASSETTE OR DISKETTE).....Includes 128 Page Users Manual..... Inventory Control.....Payroll.....Bookkeeping System.....Stock Calculations..... Checkbook Maintenance.....Accounts Receivable.....Accounts Payable.....

BUSINESS 100 PROGRAM LIST

NAME	DESCRIPTION
1 RULE78	Interest Apportionment by Rule of the 78's
2 ANNU1	Annuity computation program
3 DATE	Time between dates
4 DAYYEAR	Day of year a particular date falls on
5 LEASEINT	Interest rate on lease
6 BREAKEVN	Breakeven analysis
7 DEPRSL	Straightline depreciation
8 DEPRSY	Sum of the digits depreciation
9 DEPRDB	Declining balance depreciation
10 DEPRDDB	Double declining balance depreciation
11 TAXDEP	Cash flow vs. depreciation tables
12 CHECK2	Prints NEBS checks along with daily register
13 CHECKBK1	Checkbook maintenance program
14 MORTGAGE/A	Mortgage amortization table
15 MULTMON	Computes time needed for money to double, triple, etc.
16 SALVAGE	Determines salvage value of an investment
17 RRVARIN	Rate of return on investment with variable inflows
18 RRCONST	Rate of return on investment with constant inflows
19 EFFECT	Effective interest rate of a loan
20 FVAL	Future value of an investment (compound interest)
21 PVAL	Present value of a future amount
22 LOANPAY	Amount of payment on a loan
23 REGWITH	Equal withdrawals from investment to leave 0 over
24 SIMPDISK	Simple discount analysis
25 DATEVAL	Equivalent & nonequivalent dated values for oblig.
26 ANNUDEF	Present value of deferred annuities
27 MARKUP	% Markup analysis for items
28 SINKFUND	Sinking fund amortization program
29 BONDVAL	Value of a bond
30 DEPLETE	Depletion analysis
31 BLACKSH	Black Scholes options analysis
32 STOCVAL1	Expected return on stock via discounts dividends
33 WARVAL	Value of a warrant
34 BONDVAL2	Value of a bond
35 EPSEST	Estimate of future earnings per share for company
36 BETAALPH	Computes alpha and beta variables for stock
37 SHARPE1	Portfolio selection model-i.e. what stocks to hold
38 OPTWRITE	Option writing computations
39 RTVAL	Value of a right
40 EXPVAL	Expected value analysis
41 BAYES	Bayesian decisions
42 VALPRINF	Value of perfect information
43 VALADINF	Value of additional information
44 UTILITY	Derives utility function
45 SIMPLEX	Linear programming solution by simplex method
46 TRANS	Transportation method for linear programming
47 EOQ	Economic order quantity inventory model
48 QUEUE1	Single server queueing (waiting line) model
49 CVP	Cost-volume-profit analysis
50 CONDPROF	Conditional profit tables
51 OPTLOSS	Opportunity loss tables
52 FQUOQ	Fixed quantity economic order quantity model
53 FQEOWSH	As above but with shortages permitted
54 FQEOQPB	As above but with quantity price breaks
55 QUEUECB	Cost-benefit waiting line analysis
56 NCFANAL	Net cash-flow analysis for simple investment
57 PROFIND	Profitability index of a project
58 CAP1	Cap. Asset Pr. Model analysis of project
59 WACC	Weighted average cost of capital
60 COMPBAL	True rate on loan with compensating bal. required
61 DISCBAL	True rate on discounted loan
62 MERGANAL	Merger analysis computations
63 FINRAT	Financial ratios for a firm
64 NPV	Net present value of project
65 PRINDLAS	Laspeyres price index
66 PRINDPA	Paasche price index
67 SEASIND	Constructs seasonal quantity indices for company
68 TIMETR	Time series analysis linear trend
69 TIMEMOV	Time series analysis moving average trend
70 FUPRINF	Future price estimation with inflation
71 MAILPAC	Mailing list system
72 LETWRT	Letter writing system-links with MAILPAC
73 SORT3	Sorts list of names
74 LABEL1	Shipping label maker
75 LABEL2	Name label maker
76 BUSBUD	DOME business bookkeeping system
77 TIMECLCK	Computes weeks total hours from timeclock info.
78 ACCTPAY	In memory accounts payable system-storage permitted
79 INVOICE	Generate invoice on screen and print on printer
80 INVENT2	In memory inventory control system
81 TELDIR	Computerized telephone directory
82 TIMUSAN	Time use analysis
83 ASSIGN	Use of assignment algorithm for optimal job assign.
84 ACCTREC	In memory accounts receivable system-storage ok
85 TERMSPAY	Compares 3 methods of repayment of loans
86 PAYNET	Computes gross pay required for given net
87 SELLPR	Computes selling price for given after tax amount
88 ARBCOMP	Arbitrage computations
89 DEPRSF	Sinking fund depreciation
90 UPSZONE	Finds UPS zones from zip code
91 ENVELOPE	Types envelope including return address
92 AUTOEXP	Automobile expense analysis
93 INSFILE	Insurance policy file
94 PAYROLL2	In memory payroll system
95 DILANAL	Dilution analysis
96 LOANAFFD	Loan amount a borrower can afford
97 RENTPRCH	Purchase price for rental property
98 SALELEAS	Sale-leaseback analysis
99 RRCONVBD	Investor's rate of return on convertable bond
100 PORTVAL9	Stock market portfolio storage-valuation program

☐ **TRS-80 Cassette Version** **$99.95**
☐ **TRS-80 (Mod-I or III), Pet, Apple or Atari Versions** **$99.95**
☐ **TRS-80 Mod-II, IBM, Osborne and CP/M Versions** **$149.95**

ADD $3.00 FOR SHIPPING IN UPS AREAS
ADD $4.00 FOR C.O.D. OR NON-UPS AREAS
ADD $5.00 TO CANADA AND MEXICO
ADD PROPER POSTAGE OUTSIDE OF U.S., CANADA AND MEXICO

NEW TOLL-FREE ORDER LINE
(OUTSIDE OF N.Y. STATE)
(800) 431-2818

H & E COMPUTRONICS INC.
MATHEMATICAL APPLICATIONS SERVICE™

50 N. PASCACK ROAD
SPRING VALLEY, NEW YORK 10977

24 HOUR ORDER LINE
(914) 425-1535

ASK FOR OUR 64-PAGE CATALOG
DEALER INQUIRIES INVITED

ALL PRICES & SPECIFICATIONS SUBJECT TO CHANGE
DELIVERY SUBJECT TO AVAILABILITY

CIRCLE 156 ON READER SERVICE CARD

file, simply rearrange the pointers. Listing 6(c) shows another version of Bubble Sort set up to sort a disk file. The program in 6(c) was written and run on an Osborne 1 personal computer.

Listing 6(a). A simple change may be made to any of the sort routines to sort character strings. Shown in (a) is a modified Bubble Sort. In (b) pointers (described in the text) are used to make the implementation somewhat faster.

```
1000 FOR I = 1 TO N - 1
1010 FOR J = I TO N
1020    IF S$ (J) < S$ (I) THEN T$ = S$ (J): S$(J) =
        S$ (I): S$ (I) = T$
1030 NEXT J
1040 NEXT I
1050 RETURN
```

Listing 6(b).

```
1000 FOR I = 1 TO N - 1
1010 FOR J = I TO N
1020    IF S$ (P(J)) < S$ (P(I)) THEN T = P (J): P(J)
        = P (I): P (I) = T
1030 NEXT J
1040 NEXT I
1050 RETURN
```

Listing 6(c).

```
10 N=25
20 DIM P(N)
30 OPEN "R", #1, "SORTFILE",8
40 FIELD #1, 8 AS R$
50 ' CREATE RANDOM DATA IN THE FILE
60 FOR I=1 TO N
70   RSET R$=STR$(INT(RND*1000))
80   PUT #1, I
90 NEXT I
100 ' SET UP THE POINTERS
110 FOR I=1 TO N
120   P(I)=I
130 NEXT I
140 ' GO DO THE SORT
150 GOSUB 1010
160 ' PRINT OUT THE SORTED TABLE
170 FOR I=1 TO N
180   GET #1, P(I)
190   PRINT R$
200 NEXT I
210 STOP
1000 ' DO BUBBLE SORT ON THE RECORDS, EXCHANGING
     POINTERS
1010 FOR I=1 TO N
1020   GET #1, P(I)
1030   R1$=R$
1040   FOR J=I TO N
1050     GET #1, P(J)
1060     IF R$ < R1$ THEN T=P(J): P(J)=P(I): P(I)=T:
         GET #1, P(I): R1$=R$
1070   NEXT J
1080 NEXT I
1090 RETURN
```

Sorting on Fields

Normally, sorting is not performed on simple data objects such as single names or arrays of numbers, but on complex groups of data called records. A typical record might have the layout shown in Figure 2. If a data file having records such as R$ is sorted using the string sorts described so far, an alphabetic ordering, based on the last name and then the first name is produced.

Suppose that the file should be sorted by zip code, instead of name. Then, all comparisons are made using just the 5-byte field containing the zip code. A more complicated sort might be based on several fields. For example, suppose a business needed to sort its customer records by city, and then by zip code within each city, and then by customer name within each of the zip code areas.

Figure 2. Typical Customer Record.

R$=	Name	Address	City	Zip Code
	32 bytes	24 bytes	16 bytes	5 bytes

Sorting on fields. When the records to be sorted have more than a single name, the sort may be made on an individual field within the record. In some cases, the sort may be made on several fields. For example, a business may wish to sort by zip code and then by name within each zip code area.

Three comparisons must be made for each record. First the city field, then the zip code field, and finally the name field.

Summary

Numerous sorting techniques are available to organize tables or files of data records. Shellsort is generally the easiest to implement in the Basic language, and provides sufficient speed to sort fairly large tables. Quicksort is slightly more difficult to program in Basic because it must maintain its own stack to manage the partitioning. Yet it is easily programmed in languages like Pascal, Ada, and Algol.

Nevertheless, the slow and less efficient sorts, such as Bubble Sort and Selection Sort, can be very useful for small tables. The Insertion Sorts, especially the Binary Ordered Table algorithms, provide efficient methods of table searching, while simultaneously sorting the data into alphabetic or numeric order. Although not shown in the examples, the algorithms are easily altered to sort tables into descending order, usually by changing a less than symbol to a greater than symbol, or vice versa.

This four-part series has covered searching, sorting, and data structures. Several techniques have been presented to manipulate data using inobvious but fast methods of processing. I hope these techniques will prove useful in solving your programming problems. Data structures are the foundation of much of the work in computer science. Knowing about data structures and how to use them makes learning about other areas of computering much easier.

The references shown at the end of each section provide a ready source of additional information for the curious reader.

References

Algorithms 63, 64, 65, and 201. Collected Algorithms From CACM.

Hines, Theodore C., and Lois Winkel, "Sorting and Filing Complex Alphanumeric Entries," *Creative Computing,* July 1981, Vol. 7, No. 7, pp. 128-129.

Knuth, Donald E., *The Art of Computer Programming: Searching and Sorting,* Vol. 3, Addison-Wesley Publishing Co., Reading, MA, 1973.

Lorin, Harold, *Sorting and Sort Systems,* Addison-Wesley Publishing Co., Reading, MA, 1975.

Nijenhuis, Albert N., "How Not To Be Out of Sorts, Part 1: Insertion Sort," *Creative Computing,* Aug. 1980, Vol. 6, No. 8.

____"Part II: Heapsort," Sept. 1980, Vol. 6, No. 9, p. 136-137.

____"Part III: Linked Merge Sort," Oct. 1980, Vol. 6, No. 10.

Standish, Thomas A., *Data Structure Techniques,* Addison-Wesley Publishing Co., Reading, MA 1980.

Walker, Bill, "Sorting with Binary Trees," *Byte,* Oct. 1980, Vol. 5, No. 10, p. 96. □

IT'S ENOUGH TO MAKE YOUR HEAD SPIN

80 Columns For Your ATARI® 800

NOW YOU DON'T HAVE TO BE LIMITED BY 40 COLUMNS FOR YOUR ATARI BUSINESS APPLICATIONS.

The **FULL-VIEW 80** Display Card combines the best of two worlds—80-column capability with normal ATARI 40 column/graphics mode. 80-column mode provides upper and lower case characters with full descenders. Add the **32K MEMORY PLUS** with the FULL-VIEW 80 to achieve a 48K, 80-column system.

The 32K MEMORY PLUS card can also replace the 8K or 16K RAM card in your ATARI 400 to provide you with a 32K system.

CONTACT YOUR
ATARI DEALER OR BIT 3.

Dual Communication For Your APPLE II®

The **DUAL-COMM PLUS** adds two fully independent serial I/O interfaces to your APPLE II. Each serial interface can be set to respond to its own APPLE slot number or both interfaces can be operated from the same slot location. Slot locations are selected by two thumbwheel switches on the card, one for each serial port. Because each serial port has its own crystal-controlled baud rate generator, each port can be individually selected from 50 to 19200 baud. Either serial port can be used as an input port, an output port, or both. The on-board firmware provides special support for printers and modems but the card can also be used with general purpose serial devices such as a voice synthesis unit, video disks, or any number of other RS232 peripherals.

Additional Features: On-board firmware provides extensive printer and U/L case terminal/modem support. Great with an 80 x 24 card (especially the Full-View 80) and a Novation CAT or Hayes Smartmodem. Can be programmed for async., sync., or even SDLC operation. Supports interrupts. Uses Z80 SIO chip. Works with the APPLE II PLUS, APPLE PASCAL, Z80 SOFTCARD, and 80 column cards (especially the BIT 3 FULL-VIEW 80). Each port has a 4 character FIFO receive data buffer. Jumper plug permits user to "customize" the RS232 connections. Two 10 inch cables with RS232 connectors are included.

Other quality products by **BIT 3**

COMPUTER CORPORATION

FULL-VIEW 80: 80 x 24 display card for APPLE II or ATARI 800

MEMORY PLUS: 16K RAM card for APPLE II or 32K RAM card for the ATARI 400/800

8120 Penn Avenue South, Suite 548
Minneapolis, Minnesota 55431
(612) 881-6955

MasterCard

VISA®

Atari is a registered trademark of ATARI, Inc.; Apple II is a registered trademark of Apple Computer, Inc.; Z80 Softcard is a registered trademark of Microsoft Consumer Products; Smartmodem is a trademark of D.C. Hayes, Associates, Inc.; Novation CAT is a registered trademark of Novation, Inc.; FULL-VIEW 80, MEMORY PLUS, and DUAL-COMM PLUS are reg. trademarks of BIT 3

CIRCLE 126 ON READER SERVICE CARD

We Are The Systems Specialist

COMPUSHACK

SPECIAL PRICES ARE ONLY PART OF OUR SERVICE

THE COMPUSHACK LINE OF SPECIALS

APPLE 100% Apple compatible; runs DOS 3.3, PASCAL, CP/M, etc. 15% more storage by using enhancer diskette. 300% faster track-to-track speed.

INTRODUCTORY PRICE

$259.00

SUGGESTED RETAIL PRICE	$429.00
Drive with controller card	**$329**
Same drive but slim line (no controller)	**$349**
Slim line drive 1 MB capacity	**$599**

APPLE II+ Complete System: **APPLE II+** Computer, disk drive and controller, 12″ monitor, green screen	**$1699**
APPLE II+ compatible Winchester drives 5 MB	**$1795**
10 MB	**$1995**

Includes controller, cables, software for CP/M, DOS or **PASCAL.**

8″ drive, controller, power supply, cables, cabinet and software	**$1595**
APPLE II plus 64K, Z80 card, 80 column card, controller hardware diagnostic, DOS 3.3, disk drive 163K, green monitor—runs DOS 3.3, CP/M and PASCAL	**$1950**

OTHER PRODUCTS FOR APPLE II

VERSAcard-multifunction board	**$169**
BSR Transducer	**$19**
Applications/Demo Disk	**$25**
Parallel Printer Card	**$69**
PRT-1 with cable	**$75**
PRT-1 with EPSON 80/100 screen graphics dump with cable-Graffitti card	**$99**
PRT-1 with NEC 8023 or C.ITOH PROWRITER screen Dump Graphics	**$99**
16K ram card	**$89**
32K ram card	**$175**
64K ram card including DOS 3.3 disk emulator	**$279**
128K ram card including DOS 3.3 disk emulator	**$369**
PASCAL disk emulator	**$39**
DOS 3.3 disk emulator	**$39**
Visicalc Expand Program	**$59**
VERSAbox Spooler/buffer 16K Centronics Input/Output	**$199**
VERSAbox Spooler/buffer 16K Centronics and RS232C	**$239**
VERSAbox Real Time Clock/Display option	**$129**
16K Memory Modules for VERSAbox	**$39**
Standard 6′ Centronics Parallel Cable for EPSON, C-ITOH, NEC, ANADEX, and others	**$22**
Standard 6′ Paper Tiger or Prism Printer cable, Parallel Centronics Male DB25	**$26**
Miscellaneous cables for various printers. Please specify for Qume, Diable, Votrax, NEC Spinwriter or other	**$26**
80 Column card	**$169**
Z80 card (no CP/M software included)	**$149**
Controller for Apple II including hardware diagnostics	**$95**

IBM PC with 256K memory, disk drive controller, 2 drives and a green 12″ monitor	**$2799**
Floppy drive controller	**$189**
Controller with one serial interface	**$249**
Board with one parallel and two serial interface (no controller)	**$249**
Big Blue Card (multifunction card)	**$489**
Single side, single density drive 5¼″	**$195**
Double side, double density drive 5¼″	**$249**
Tandon TM 100-1 5¼″ SS SD drive 250 KB capacity	**$208**
Tandon TM 100-2 5¼″ DS DD drive 500 KB capacity	**$269**
Tandon TM 100-4 5¼″ 96 TPI drive 1 MB capacity	**$379**

MEMORY: For IBM Personal Computer

128K—**$299** 256K—**$499** 512K—**$799**

Combo Card: Features Clock Calendar, 256K Memory, Parallel Port 4 Serial Port	**$699**
IBM Personal Computer Hard Disk System HDI-100 5 MB Winchester, software, power supply cabinet, cables, etc.	**$1795**
Same with 10 MB	**$1995**

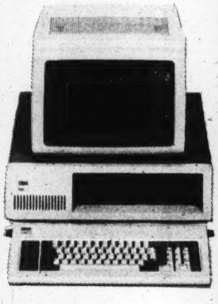
APPLE COMPATIBLE COMPUTERS BASIS & FRANKLIN AVAILABLE

COMPUSHACK

apple®

COMPUSHACK

IBM®



DISK DRIVES

TANDON:

TM 100-1	**$199**	TM 848-2	**$499**
TM 100-2	**$265**	TM 602-5 MB	**$899**
TM 100-4	**$379**	TM 603-10 MB	**$1049**
TM 848-1	**$399**		

SHUGART:

SA 400	**$215**	SA 800/801	**$379**
SA 450	**$281**	SA 850/851	**$535**

SIEMENS:

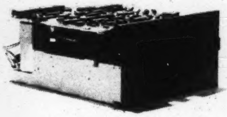
FDD 100-5	**$189**	FDD 100-8	**$349**
FDD 200-5	**$259**	FDD 200-8	**$449**

QUME:

DT-5	**$279**	DT-8	**$469**

TEAC:

FD50A	**$189**	FD55A	**$199**
FD50B	**$269**	FD55B	**$279**
FD50E	**$269**	FD55E	**$279**
FD50F	**$389**	FD55F	**$399**



MONITORS & PRINTERS

BMC 12″ green	**$89**
BMC 12″ green (high res.)	**$149**
BMC 13″ color monitor	**$289**
C.ITOH Prowriter parallel	**$499**
C.ITOH Prowriter serial	**$599**
C.ITOH Prowriter 15″ carriage...Parallel	**$699**
F10 Daisywheel letter quality	**$1495**

OKIDATA

82A	**$459**	83A	**$730**
84AP	**$999**	84AS	**$1099**

EPSON

		MX-80	**$469**
MX-80 FT	**$525**	MX-100	**$699**

AMDEK VIDEO MONITORS

Video-100	**$95**	Color II	**$675**
Video-300	**$169**	Color III	**$420**
Color I	**$345**		

NEC

12″ green screen	**$169**		
RGB Color Monitor	**$959**		
Spinwriter 3510	**$1799**		
NEC Letter quality printer 7715	**$2399**		
PC 8001	**$899**	PC 8031A	**$799**
PC 8012A	**$559**	PC 8023A	**$499**
PC 8033A	**$169**		

CABINETS/POWER SUPPLY

Dual 8″ disk drive cabinet with power supply	**$249**
Cabinet/power supply for single 8″ drive	**$179**
Dual 5¼″ disk drive cabinet with power supply	**$99**
Single 5¼″ disk drive cabinet with power supply	**$69**
2 single side double density 8″ disk drives, cabinet/power supply	**$895**

ALTOS

Computer 8000-15	**$3999**		

EAGLE

Computer System

Eagle II	**$2699**		
Eagle III	**$3333**	Eagle IV	**$4999**

ADDS VIDEO MONITORS

View Point A1	**$560**	View Point A2	**$499**

TELEVIDEO

910C	**$599**	912C	**$759**

CORVUS

5 MB Winchester	**$2999**		
10 MB	**$4399**	20 MB	**$5299**

SOFTWARE

Profit Plan	**$179**	Data Star	**$269**
Micro Plan	**$399**	Super Sort I	**$199**
Word Star	**$299**	Super Sort II	**$169**
Mail Merge	**$99**	The Accountant	**$299**
Spell Star	**$199**	Tax & Cash	**$299**

SANYO MBC—1000 COMPUTER

Z-80 (4MHz) Microprocessor 64K, 12″ CRT, 1 Serial, 1 Parallel, port CP/M Version 2.2 Operating System Word Star, Mail Merge, Spell Star	**$1995**

KEY COMP II COMPUTER

Z-80 Based CPU, 64K ram 9″ display, 80 columns, x24 rams CP/M 2.2, MA-Basic; Selectword included	**$1699**

THIS MONTH'S SPECIAL! PRINTERS

BROTHER Mcdel HR-1
16 CPS, Daisywheel,
letter qualify,
bidirectional printer **$769.00**

SMITH CORONA TP-1
12 CPS, 10 or 12 CPI,
Unidirectional
Letter quality printer **$569.00**

WE'RE OPENING RETAIL STORES THROUGHOUT THE U.S.A. **SOON!**

FRANCHISE INQUIRIES WELCOME

Prices subject to change without notice

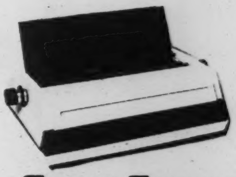
ALL FLOPPIES REPAIRED QUICKLY AT LOW COST

Sales and Service:
(714) 730-7207
Headquarters
Telex: 18-3511
Answer Back CSMA

CIRCLE 145 ON READER SERVICE CARD

CompuShack
ALTOS

CompuShack
SANYO



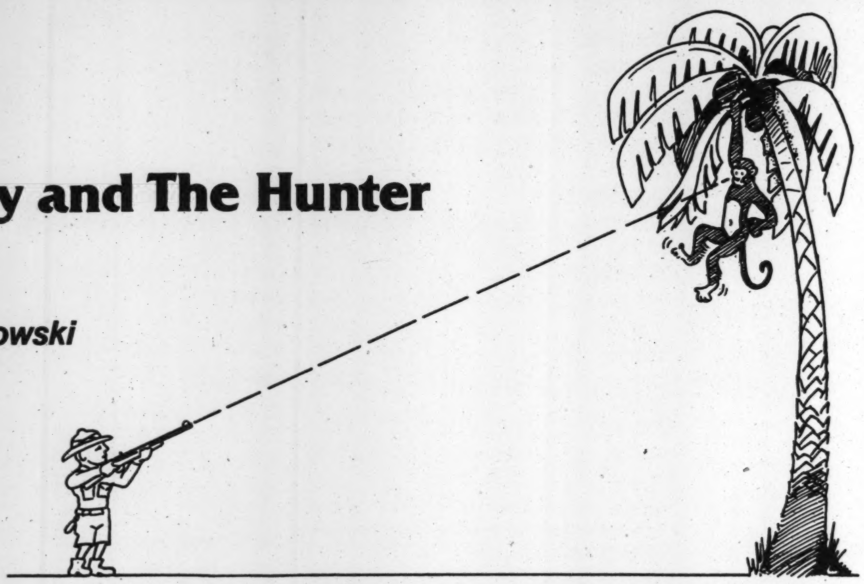
CompuShack
brother.

CompuShack
SCM

CompuShack
NEC

COMPUSHACK
2630-H Walnut Avenue Tustin, CA 92680
Business Home Computers

The Monkey and The Hunter



Steve Rogowski

One of the classic problems posed to students of physics is the quandary of the monkey and the hunter. It is a study in the mechanics of projectile motion. Embodied in the solution are elements of geometry, trigonometry, ballistics, projectile mechanics, vector analysis and in this case, a new twist, some elementary computer graphics.

The problem goes something like this. A hunter is deep in the darkest woods in search of a rare breed of monkey. He is armed with bullets which do not kill. They merely subdue monkeys temporarily so they can be packed and shipped to game farms and zoos. These monkeys have extremely keen vision and extraordinary reflexes. They can actually see a bullet leave the end of a rifle barrel. The monkeys can usually be found hanging leisurely from the branches of the tallest trees. When they catch sight of the hunter's bullet—long before the sound of the exploding gunpowder has reached their ears—they release their grip on the branch and fall to earth. Where, then, should the hunter aim to assure that the bullet will strike the monkey?

Physics Apparatus

I offer this problem in a computer magazine because a small micro-computer is an excellent tool for the analysis of the motion of both bullet and monkey. Physics teachers have posed this problem—much to the delight of their students—for years. They have continually devised methods for illustrating the mechanics of this problem. The closer the experiment to the real thing, the more the students like it. I have built launchers from scrap lumber, laboratory tubing, blow guns, straws, photocells, wire, batteries and electromagnets. I have seen monkeys made from styrofoam, balsa wood, rubber, plastic, steel and even an old sock. I have used chalk, pencils, rubber darts, real darts, pins, nails, corks and other material for projectiles. With these devices the action is realistic but over very quickly. Oh, not as quickly as if I rented a real monkey and used real bullets in the real deep dark woods. Even a blow gun projectile moves too fast for the human eye to study. You can follow the motion but you can't study it. But the results are the same. Students learn quickly that the only way to hit the monkey is to aim straight at him. Seems logical! But many students think you should aim under the monkey. They think monkeys fall faster than bullets. Sometimes the chalk will bounce off the monkey and evidence of a direct hit is circumstantial. That's where the old sock comes in. If you make the monkey from an old sock around a steel embroidery ring, the sock can be used to catch the projectile. The metal ring is suspendable from an electromagnet. There's no denying a direct hit then. Back issues of *The Physics Teacher* abound with new ideas for demonstrating this delightful problem.

Despite all this apparatus I always felt that much could be learned from a detailed analysis of the motion of both bullet and monkey as they came under the influence of gravity. I've even tried photographing the whole scheme as a time exposure. That was cumbersome and never seemed to be worth the effort for the pictures I got.

With the advent of the inexpensive micro, with decent graphics resolution, it is possible to take a new look at this old problem in a straightforward but novel way.

The Plan

So, I should like to describe below my analysis of the situation. First, I shall prove, with some mathematical rigor, that the only way to hit the monkey is to aim directly at him. Then, I shall offer some empirical proof that this mathematical contention is borne out by the facts. I include several computer programs to look at the motion tabularly. Finally, I offer two programs which allow the entire motion of the projectile and the monkey to be displayed in real time on your micro. These programs can be used on any computer system with even a moderate graphics capability. However, I ran and debugged these particular programs only on the TRS-80 Color Computer with Extended Color Basic and on the Atari 800.

The lessons learned here can be extended far beyond this particular problem. If you want to add realism to any games you are writing, you may wish to include the influence which gravity exerts on bodies in motion. The equations developed below actually describe the real motion of projectiles and other falling objects. In fact, the key to understanding the solution to this problem is embodied in that very thought. Projectiles, like monkeys who've released their grip, are actually falling bodies, even as they speed away from the ground.

Steve Rogowski, Computing Center, State University of New York at Albany, Albany, N.Y. 12222

THE BEST ADD-ONS TO YOUR TIMEX-SINCLAIR 1000

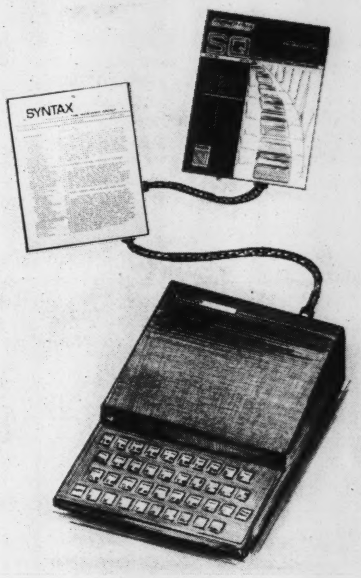
SYNTAX and SQ

SYNTAX newsletter brings you news, reviews, and applications, plus technical notes for circuit-builders. Enough to keep you busy month after month. Through SYNTAX you can communicate with thousands of Sinclair and Timex users to share problems and advice about programs and vendors. You get timely updates about new hardware, software and publications. And we cover all the Timex-Sinclair computers, including ZX80/MicroAces, as well as ZX81s and the new Timex-Sinclair 1000s. When Sinclair's new Spectrum reaches the US, you'll find Spectrum programs and applications in SYNTAX. Even our ads keep you up to date on the ZX/Timex world.

SYNTAX emphasizes practicality. You can use our programs and projects even if you aren't sure at first why they work, because you get complete directions. Text is clear and easy to understand. SYNTAX readers already know about:

- Adding a Joystick (6/82)
- Adding Big Keyboard (12/80)
- QS Hi-Res Graphics (4/82)
- Making a Phone Dialer (2/81)
- FORTH on ZX/TS (5/82)
- 8K Income Tax Program (6/82)
- Building Additional RAM (3/81, 2/82)
- Alphanumeric Sorts (10/81)

And SYNTAX readers respond to what they get every month:



Thank you for supplying back issues of SYNTAX . . . After looking them over I am convinced that your publication offers superior information on the ZX81 microcomputer.

Steve Simcic
Cleveland Institute of Electronics

I'm really pleased with SYNTAX — both content and service. It's the best (and only reliable) support in N. America for ZX enthusiasts . . .

Bob Partridge
Pickering, Ontario

AN UNCONDITIONAL GUARANTEE: We are so sure you'll find SYNTAX and SQ useful that we promise to refund your entire subscription fee if you aren't satisfied. An unconditional guarantee — you can't lose, so choose your deal on the coupon below and return it to SYNTAX/SQ now.

SQ, The Syntax Quarterly, is the new all-Timex-Sinclair US magazine. Published by the same people who bring you SYNTAX, **SQ** will contain expanded coverage of all the Timex-Sinclair computers, including the Spectrum. It brings you 64 pages of useful and educational programs, extensive hardware projects, and in-depth tutorials for beginning and advanced users alike.

SQ's detailed objective reviews will help you choose among the latest hardware and software available in the US and UK. You'll get tutorials on BASIC and machine language programming, so you can move from novice to advanced user. And with our tested hardware projects you'll be able to expand and tailor ZX/TS capabilities to your own purposes. Through our letters to the editor you can benefit from the experience of thousands of ZX/TS users worldwide.

WHAT'S SPECIAL ABOUT OUR PUBLICATIONS?

We work hard to bring you quality and to print useful programs accurately. Each program is tested to make sure it works, that it fits in the designated RAM, and that it runs when you follow the directions. We invented Syntactic Sum™ as an additional aid for you in getting error-free programs.

Join the others who stretch their Timex-Sinclair computers to their utmost. Act now — as soon as we receive your coupon with payment, your first issue of SYNTAX will be on its way, with **SQ** right behind. For faster service, phone your credit card order to 617/456-3661. Don't miss out — order now!

Syntax/SQ, RD 2 Box 457, Harvard, MA 01451 USA 617/456-3661

Fill out the coupon below and mail it to: SYNTAX/**SQ**, RD2 Box 457, Harvard, MA 01451

CC12

☐ My check is enclosed.
Make checks payable to:
SYNTAX ZX80, Inc.

☐ Please charge my ☐ VISA ☐ Diner's Club ☐ American Express ☐ Mastercard ☐ Carte Blanche account.

Account number ____________________
Exp. date __________ Bank number (MC only)
Signature ____________________
Name ____________________
Address ____________________
City __________ State __________ Zip __________
Day phone ( ) __________ Evening Phone ( ) __________

YES! Please send me:

☐ The Combination (12 issues of SYNTAX and 5 issues of SQ)	$39
☐ The Catch-up (SYNTAX Jan. 82-Dec. 83, 5 issues of SQ, plus 1 binder)	$77
☐ **The Works** (SYNTAX Nov. 80-Nov. 83, SQ Nov. 82-Nov. 83, plus 2 binders, a 50% savings)	$97
☐ 12 issues of SYNTAX	$29
☐ 4 issues of SQ, The Syntax Quarterly	$15
☐ 1 Premier Issue of SQ	$4.95
☐ 1 Binder	$9
☐ 1 issue of SYNTAX	$4

These offers expire 31 Dec. 82 — SUBSCRIBE NOW

CIRCLE 348 ON READER SERVICE CARD

The program allows the user to select the initial velocity of the bullet, the aiming angle and the time window. It is possible to select parameters which will not result in a successful hit even when aiming at the monkey. That's what makes this problem so interesting. The bullet must have enough initial velocity to reach the target. It must also hit the monkey before the monkey hits the ground. Although an interesting question can be posed here. Can the monkey hit the ground and be struck later by the bullet if he doesn't flee?

Try using 200 feet per second as a starting point for muzzle velocity. This works well with the 300 foot range and 150 foot elevation. Extremely fast initial velocities cause the bullet to make contact with the monkey even as he lets go of the branch.

The program will compute the correct aiming angle for you, in case you wish to vary *x* and *y* in lines 130 and 140. It is just a recommendation though. You may use any aiming angle you choose. The value recommended is stored in *T2* and is in degrees. You may aim anywhere you like as the INPUT statement in line 210 suggests. Line 220 converts your angle of fire from degrees to radians. Line 250 allows you to look at whatever slice of time you choose. Be careful to select a small enough increment. This will ensure that the time of impact is covered by the time scan and not simply bypassed. You see it's possible to look at such large increments of time that bullet and monkey meet at some time in between the ones you've printed.

In program lines 300-330, (*X1*, *Y1*) represent (x_b, y_b) and (*X2*, *Y2*) stand for (x_m, y_m). The value of $g = 32$ ft/sec^2 is set in line 150.

Testing on lines 350-390 stops the printing when either the bullet or the monkey strikes the ground. A much more refined set of tests is left as an exercise for the reader.

The most important test comes in lines 400-410. Here the bullet and the monkey are required to be within 1.1 feet of each other both vertically and horizontally. The constant 1.1 can be adjusted to reflect the size of the monkey and your tolerance for error. A bigger value will be more forgiving. Don't just test to see if *X1* = *X2* and *Y1* = *Y2*. Basic will not consider them equal if they differ in the fifth decimal place. That kind of accuracy is the difference between hitting the monkey in the nose or on the lip.

PROGRAM 1

```
100 PRINT
110 PRINT 'INPUT MUZZLE VELOCITY OF BULLET (TRY 200 TO
     START)';
120 INPUT V
130 X=300         @DISTANCE FROM TREE TO HUNTER
140 Y=150         @HEIGHT OF MONKEY ABOVE GROUND
150 G=32          @ACCELERATION DUE TO GRAVITY OF 32
     FT/SEC↑2
160 T2=ATN(Y/X)*57.29578   @ANGLE OF ELEVATION OF MONKEY
     IN DEGREES
170 PRINT
180 PRINT 'MONKEY IS ELEVATED AT AN ANGLE OF ';T2;' DEGREES
     FROM HUNTER'
190 PRINT
200 PRINT 'INPUT ANGLE OF ELEVATION FOR FIRING ';
210 INPUT A
220 A1=A/57.29578   @CONVERT TO RADIANS
230 PRINT
240 PRINT 'SPECIFY START TIME, END TIME, INCREMENT'
250 INPUT B,L,N
260 PRINT
270 PRINT 'TIME','BULLET (X)','BULLET (Y)','MONKEY (X)','MONKEY
     (Y)'
280 PRINT
290 FOR T=B TO L STEP N
300 X2=X          @MONKEY'S X-POSITION AT TIME T
310 Y2=Y-(.5*G*T↑2)   @MONKEY'S Y-POSITION AT TIME T
320 X1=V*COS(A1)*T    @BULLET'S X-POSITION AT TIME T
330 Y1=V*SIN(A1)*T-(.5*G*T↑2)  @BULLET'S Y-POSITION AT TIME
     T
340 PRINT T,X1,Y1,X2,Y2
350 IF Y2<0 THEN PRINT 'MONKEY LANDED SAFELY (TRY FASTER
     BULLET)'
360 IF Y2<0 THEN PRINT '(OR AIM MORE ACCURATELY!)'
370 IF Y2<0 AND Y1>=0 THEN 440
380 IF Y2>0 AND Y1<0 THEN PRINT 'BULLET HIT GROUND
     ';X-X1;'FT SHORT'
390 IF Y2>0 AND Y1<0 THEN 440
400 IF ABS(X1-X2)<1.1 AND ABS(Y1-Y2)<1.1 THEN PRINT 'YOU
     GOT HIM!'
410 IF ABS(X1-X2)<1.1 AND ABS(Y1-Y2)<1.1 THEN 440
420 NEXT T
430 PRINT 'YOU DID NOT HIT THE MONKEY IN THE TIME FRAME
     SCANNED!'
440 PRINT
450 PRINT 'DO YOU WANT TO TRY ANOTHER SET OF INPUTS
     (YES=0, NO=1)'
460 INPUT W
470 IF W=0 THEN 100
480 END
```

"Why do I have to write to Santa? Why can't I just enter my requests into his computer?"

Below is a table generated by the program above from the input which follows:

```
INPUT MUZZLE VELOCITY OF BULLET
(TRY 200 TO START)? 200

MONKEY IS ELEVATED AT AN ANGLE OF
26.565052 DEGREES FROM HUNTER

INPUT ANGLE OF ELEVATION FOR FIRING? 26.565052

SPECIFY START TIME, END TIME, INCREMENT
? 1.6,1.8,.01
```

TABLE 1
MUTUAL POSITION OF BULLET AND MONKEY (Case 1)
DIRECT AIM

TIME	BULLET (X)	BULLET (Y)	MONKEY (X)	MONKEY (Y)
1.60	286.21670	102.14835	300	109.0400
1.61	288.00555	102.52918	300	108.5264
1.62	289.79440	102.90680	300	108.0096
1.63	291.58326	103.28123	300	107.4896
1.64	293.37211	103.65246	300	106.9664
1.65	295.16096	104.02048	300	106.4400
1.66	296.94981	104.38531	300	105.9104
1.67	298.73867	104.74694	300	105.3776
1.68	300.52752	105.10537	300	104.8416

YOU GOT HIM!

Inviting!

When the invitation arrives, you know immediately that things will be done in style.

That's the way people are thinking of **Strictly Soft Ware.**

We've issued an invitation for you to enjoy super prices, prompt delivery, and superior service.

When you're on the **Strictly Soft Ware** mailing list, you'll automatically receive our industry-leading catalog (Apple or IBM). You'll also receive news of sales, unadvertised specials, and new program releases — valuable information you can use.

So respond to the best invitation you'll find in mail-order software. Call 1-800-848-5253. There'll be no regrets.

Your presence is requested among
those who have discovered great
prices, technical support,
and customer service at
Strictly Soft Ware.

R.S.V.P. 1-800-848-5253

Holiday Gift Idea #1

*The **Strictly Soft Ware** Subscription Plan. Prepayment allows the account to be drawn upon for whatever you want, whenever you want. When we send the package, we'll provide a balance statement as well. Here's a gift that can last all year long. Also ideal for large institutions.*

SPECIALS

Dictionary	$74.99	Star Maze	$26.99
Real Estate Analyzer	$139.99	Screenwriter Pro	$149.99
Creative Financing	$139.99	The Accountant	$99.99
Visi Schedule	$238.99	Pursuit of Graf Spee	$44.99
Taxman II	$24.99	Gertrude's Puzzles	$62.99

IBM • SPECIALS • IBM

Best Financial Program	$74.99	Apple Panic	$26.99
Data Capture	$74.99	Conquest	$24.99
Math Magic	$79.99	Visicalc	$189.99
Frogger	$26.99	Temple of Apshai	$32.99

Above Specials In Effect Until Dec. 1, 1982

Holiday Gift Idea #2

*The **Strictly Soft Ware** Gift Certificate. Here's the perfect way to take the guesswork out of holiday giving. A gift certificate and the **Strictly Soft Ware** holiday catalog guarantee the perfect gift for everyone on your holiday list.*

Strictly
Soft Ware

MasterCard

VISA

We take Master Card or VISA (include card # and expiration date). Ohio residents add 5.5% tax. Include $2.50 for postage. 3% discount if check accompanies order.

Send for free catalog. Prices subject to change. Holiday Hours: 9-9:30 weekdays; 9-6 Sat.; 12-5 Sun.

Strictly Soft Ware
Post Office Box 338
Granville, Ohio 43023
order by phone **800-848-5253**
in Ohio **614-587-2938**

Apple is a registered trademark of Apple Computer, Inc.
IBM is a registered trademark of International Business Machines Corp.

CIRCLE 342 ON READER SERVICE CARD

In this example, the position of the bullet and monkey are the same sometime between 1.67 and 1.68 seconds. The exact time of impact can be calculated from $t = x/(v_0 \cdot \cos \theta_b)$. In this case, $t = 300/(200 \cdot \cos(26.565°)) = 1.677$ seconds. A display of time broken into thousandths of a second would reveal that we had matched position coordinates. Our test allowing a margin of 1.1 feet caused the program to recognize a hit even though we didn't slice the time as thin as we could have.

Notice that the bullet was still rising when it struck the monkey some 45 feet below the tree branch. A slower initial velocity will produce a more dramatic effect when plotted. Be careful not to reduce the muzzle velocity too much or the bullet won't reach the monkey. Using the values for *x* and *y* here, a bullet will go 300 feet only if its muzzle velocity exceeds 109.54 feet/sec.

The range of a projectile can be computed from:

$$r = (2 \cdot v_0^2 \cdot \cos \theta_b \cdot \sin \theta_b)/g = (v_0^2 \cdot \sin 2\theta_b)/g$$

The total flight time $t = (2 \cdot \sin \theta_b \cdot v_0)/g$ is the time the bullet would stay in flight if it didn't strike anything. This is not the same as the value for *t* offered earlier which is time to reach a certain horizontal distance from start. The latter is total flight time without collision, or time to reach maximum range, the former represents time to strike the monkey.

The reader is encouraged to refine the tests given on lines 350-390 so that printing and later plotting does not continue after all chance of striking the monkey has passed.

Aiming Low

The table below gives the results of running Program 1 while aiming under the monkey, in this case at an angle of only 20 degrees. Many students believe this is the proper strategy for hitting the monkey.

```
INPUT MUZZLE VELOCITY OF BULLET
(TRY 200 TO START)? 200

MONKEY IS ELEVATED AT AN ANGLE OF
26.565052 DEGREES FROM HUNTER

INPUT ANGLE OF ELEVATION FOR FIRING? 20

SPECIFY START TIME, END TIME, INCREMENT
? 1.59,1.64,.01
```

"Now I know why he has all the bananas!"

TABLE 2
AIMING BELOW THE MONKEY (Case 1)

```
TIME   BULLET (X)   BULLET (Y)   MONKEY (X)   MONKEY (Y)
1.59   298.82225    68.312802       300       109.5504
1.60   300.70163    68.486444       300       109.0400
1.61   302.58102    68.656883       300       108.5264
1.62   304.46040    68.824123       300       108.0096
1.63   306.33978    68.988163       300       107.4896
1.64   308.21917    69.149004       300       106.9664
YOU DID NOT HIT THE MONKEY
IN THE TIME FRAME SCANNED!
```

Clearly the bullet comes within range of the monkey between 1.59 and 1.60 seconds. However, when it does it is 68.4 feet above the ground and climbing at a time when the monkey is 109.3 feet above the ground and falling. This angle of fire results in the bullet passing 41 feet below the monkey. The results are even more striking when plotted. The trajectories are clearly visible on the screen. I'll show you how to modify the programs to plot points instead of printing tables towards the end of the article.

Aiming High

To completely exhaust case 1 the situation where aim is taken above the monkey must be considered.

```
INPUT MUZZLE VELOCITY OF BULLET
(TRY 200 TO START)? 200

MONKEY IS ELEVATED AT AN ANGLE OF
26.565052 DEGREES FROM HUNTER

INPUT ANGLE OF ELEVATION FOR FIRING? 30

SPECIFY START TIME, END TIME, INCREMENT
? 1.71,1.77,.01
```

TABLE 3
AIMING ABOVE THE MONKEY (Case 1)

```
TIME   BULLET (X)   BULLET (Y)   MONKEY (X)   MONKEY (Y)
1.71   296.18066    124.21439       300       103.21441
1.72   297.91272    124.66559       300       102.66561
1.73   299.64476    125.11359       300       102.11361
1.74   301.37681    125.55839       300       101.55841
1.75   303.10886    125.99999       300       101.00001
1.76   304.84091    126.43839       300       100.43841
1.77   306.57296    126.87359       300        99.87361
YOU DID NOT HIT THE MONKEY
IN THE TIME FRAME SCANNED!
```

Here the angle of fire is 30 degrees—well over the monkey's head. As the bullet reaches a range of 300 feet, between 1.73 and 1.74 seconds, it is some 125 feet off the ground and rising but the monkey is only 102 feet off the ground. The bullet is a good 23 feet high!

Case 2

That exhausts case 1. Now let's look at case 2. This is where the hunter and the monkey are the same height above the ground. The hunter is either on a hill some distance, 300 feet here, from the tree or he has climbed a tree of his own.

Here we will consider what happens only for the scenario where we aim directly at the monkey. The equations were developed earlier and are reflected on lines 300-330 of program 2. I've also removed the firing angle inputs for this program. The reader may wish to reinsert them to verify that the aiming situation is the same: *to hit the monkey, you must aim at him.*

COMPUTER SPECIALTIES

ORDER TOLL-FREE!! 1-800-854-2833

COMMODORE

VIC-20

$179

HARDWARE

Dataset	64	Super Expander	49
Disk Drive	469	Programmers Aid Cart	44
Graphic Printer	328	VicMon	43
8K Mem. Expander	39	Pro. Ref. Guide	14
16K Mem. Expander	75	Joystick	8
24K Mem. Expander	139	3 Slot Expander	29
RS232 Card	39	Modem	95
IEEE-488 Card	69	Centronics Cable	69

NEW

6 Slot Expander	99
40 Col. 8K Board	109
Afron Expan. Chassis	198
Video Pak (40/80 col. 16K)	229
Video Pak (40/80 col. 64K)	319
Wico Joystick Delux	37★
Wico Trackball	59★
6 Slot (Soft. Select)	119
Modem (Auto Ans/Dial)★	129

NEW FROM COMPUTER SPECIALTIES

Vic Education Pak	439
Vic Small Business Pak	449
Vic Home Computer Pak	429
Vic Communications Pak	459

ON CARTRIDGE

Spiders of Mars	36	Outworld	29
Robot Blasters	30	Adventure Land	29
Meteor Run	36	Pirate Cove	29
Sattelites & Meteors	36	Mission Impossible	29
Amok	29	The Count	29
Alien Blitz	29	Voodo Castle	29
Radar Rat Race	23	Astro Blitz	38
Sargon II	33	Wizard of Wor	27
Trashman	35	Dogpatch	27
Blackhole	35	Pinball Spectacular	27
Gorf	23	Super Alien	22
Turtle Graphics	36	Vic Fourth	63

ON TAPE

Vicalc	11	Hsehold Fin. Pack	27
Bill Payer	14	Vic Journal	29
Vic 6 Paks	44	Rec/ED Pack I or II	12
Vic Trek	CALL	Un-Word Proc	13

COMMODORE 64 "APPLE LOADER" ORDER NOW — $79!

IEEE For 64	89
RS232 For 64	59
Auto Ans/Dial Modem	129

★Works with Commodore 64

Call for Vic-20 and CBM-64 Catalog

ATARI

400 16K	264
800 16K	664

410 Recorder	77	The Bookkeeper	194
810 Disk Drive	439	The Entertainer	69
825 Printer	639	The Educator	124
830 Modem	159	The Programmer	56
850 Interface	159	The Communicator	334
Full-View 80	279	PacMan*	33
Joystick (Pair)	18	Mouskattack	26
48K by Intek	189	Choplifter	27
32K by Microtek	99	Frogger	27
16K by Microtek	69	Gorf	33
Epson Cable	34	Microsoft Basic	69
Ram Cram	109	Word Processor	109
Ram Disk	429	Visicalc	189

*$25.00 if Purchased with 400 or 800

CALL NEC

PC-6001

Features: Color • Sound • 71 Key Keyboard • 10 Function Keys

"The Computer you've been waiting for! Home, Business, Education and Fun."

ACCESSORIES Available include:
- Expansion Unit
- Touch Panel
- Printer

SOFTWARE
- Music Editor
- Graph Generator
- Othello – And More!

PC-8001

PC-8001	719	PC-8031 Dual Drives	718
PC-8012 I/O	549	CP/M	139
The Wedge	489	1260 Green Monitor	129

Call For Catalog

apple

CALL

*APPLE IS A REGISTERED TRADEMARK

ACCESSORIES

Fourth Drive	299	Sooper Spooler (16K)	299
Fourth Controller	89	Z-80 by Microsoft	248
Rana Elite One	359	Videoterm (80 col.)	244
Rana Controller	99	Signalman Modem	89
Micro Sci A-2	349	Synergy Card by Spies	169
Micro Sci A-40	349	RGB by Electrohome	159
Micro Sci A-70	489	**Parallel Card (6' cable)**	69
3" Drives by Amdek	749	Z-Card by ALS	189
Vista Slim Line 8"	CALL	Versa Card	169
8" CNTRL by Vista	499	**The Grappler Plus**	119
16K Ram (2 yr WNTY)	59	Joystick by TG	46
32K by Saturn	199	In Fone	CALL
AIO II	189	The Mill	319
CCS 7710A	129	Lower Case	29
CPS Multi-Func by Mtn	169	Expan Chassis by Mtn	539
Micro Modem II®	278	Winchester Hard Disk	CALL
Smart Modem	229	**Appli-Card 4MZ**	339
Hayes 1200 Baud	539	**Appli-Card 6MZ**	429
Enhancer II	124	Strobe Plotter	659
Microbuffer II (16K)	209	**System Saver**	69
Microbuffer II (32K)	229	**Amber Monitor by USI**	179
Num. Keypad (23 Key)	115	Function Strip by Videx	59
Disk Emulator (294K)	799	**Bubble Mem by MPC**	CALL
Sup R Mod	29	App-L-Cache 256K	989
Wico Joystick Delux	37	Wico Apple Trackball	69

Vista Vision 80	269
ALF 9 Voice	149
Pkasso by IS	CALL
Premium Pak by M. S.	528
AD+DA by Mtn (no cable)	269
Apple Cat II	339
Wizard - BPO	149
Wizard - SOB	219
Thunder Clock/Cal	119
Smarterm 80 Col.	288
16 Voice by Mtn. Hard	297
8088 Card by ALF	295
Synergizer Pack by ALS	579
212 Apple-Cat II	619
The Clock by Mtn Hard	219
Voice Box (w/firmware)	149
The Dumpling-GX	129

SOFTWARE

Screen Writer II	103
Magic Window	69
SuperText II by Muse	118
AppleSpeller by Sensible	56
Exec Secretary by S. S.	189
Pro. Easy Writer by IUS	129
LetterPRFT w/mailmerge	109
Word Handler	147
General Manager	109
Visicalc by Visicorp	183
PFS by Soft Pub. Corp	69
Visifile by Visicorp	184
Visitrd/Visiplt by Visicorp	196
PFS: Report	69
DB Master	164
PFS: Graph	89
Desktop Plan	184
Wall Streeter by M.L.	219
Graph Magic by ISM	62
Target Planner Calc	36
Math Magic by ISM	63
Home Acct. by Cont	56
UCSD P-System	468

CP/M®* SOFTWARE

Basic Interpreter ™	CALL
Basic Compiler by MS	289
Cobol-80 by Microsoft	539
Fortran-80 by Microsoft	146
Word Star	196
Mail Merge	69
Spell Star	109
Data Star	166
Calc Star	109
Supercalc	212
d Base II by Ashton-tate	494
G/L by Peachtree	CALL
A/R by Peachtree	CALL
Peachcalc	CALL
Quickcode	239
Tax Preparer '82	109
Real Estate Analyzer	139
Bag of Tricks	29
Zoom Graphix	27
Special Effects	27

ENTERTAINMENT

Castle Wolfenstein	19
Flight Simulator	26
Sargon II	25
Southern Command	43
Deadline	34
Time Zone	79
Kabul Spy	26
Zork II	26
Knight of Diamonds	25
Wizardry	37
Atlantis	29
Crush, Crumble, Chomp	23
Snack Attack	22
Pinball: Nite Mission	25
Frogger	24
Davids Midnight Magic	26
Apple Panic	21
Mouskattack	24
Choplifter	24

Call For Free Catalog

*CP/M is a Registered Trademark

"NEW" ACE 1000

WITH COLOR

BASIS 108

Now Shipping — CALL

Both of these new systems are 100% compatable with the Apple Accessories and Software listed above

FREE SHIPPING*

ZENITH

Z-89-81 (48K • 1S 100K Drive)	2195
Z-90-82 (64K • 1D 160K Drive)	2369

NEW

Z-100	CALL
13" RGB Color	599

PRINTERS, MONITORS, TERMINALS

PRINTERS

C-itoh ProWriter (Para)	459
Smith-Corona TP-1	659
Okidata 82 A	479
Okidata 83 A	695
Nec 8023	469
IDS Prism 80	789
Complete Catalog	CALL

TERMINALS

Televideo 910 Plus	596
Televideo 920C	789
Televideo 950	989
Adds View Point A-1	576
Adds View Point 3A+	589
Zenith Z-19-CN	769
Zenith ZT-1	CALL

MONITORS

Amber Monitor by USI	176
Nec Green	167
Amdek Color II	679

Call For Complete List

IBM•IBM•IBM•IBM•IBM•IBM•IB

ACCESSORIES

BIG BLUE	499
Combo Card by Apparat	239
Clock/Cal by Apparat	109
64K w/Parity	249
128K w/Parity	359
192K w/Parity	539
256K w/Parity	679
Quadboard 64K	419
Quadboard 256K	679
64K Ram + by Seattle	389
256K Ram + by Seattle	799
Amdek RGB	689
AST Combo Plus 64K	469
AST Combo Plus 128K	639
Hard Disk	1589
Baby Blue	489
Expansion by Tecmar	739
Scribe Tender by Tecmar	169
Device Master by Tecmar	187

SOFTWARE

Word Star	279
Mail Merge	88
Peachtree Pkgs	CALL
Home Acct. Plus by Cont	109
Volks Writer	149
Visicalc (256K)	194
Visicalc (stnd)	157
Vedit-86 by Cmpview	149
Supercalc by Sorcim	217
Easy Writer II by IUS	258
Easy Speller by IUS	128
Fast Screen by CIJ	73
Everest Explorer	17
Deadline	39

COLUMBIA

DATA PRODUCTS, INC.

MULTI-PERSONAL COMPUTER 100% IBM P/C COMPATIBLE – CALL

TO ORDER: Phone orders invited using Visa, Mastercard, American Express, or bank wire transfers. Visa, MC, and American Express service charge of 2%. Mail orders may send charge card number (include expiration date), cashiers check, money order, or personal check (allow 10 business days for personal or company checks to clear). Please add 3% ($5.00 minimum) for UPS shipping, handling, and insurance. COD's minimum $250.00 with $25.00 deposit. All equipment is in factory cartons with manufacturer warranty. Opened products not returnable. Restocking fee for returned merchandise. Equipment subject to price change and availability. Retail prices differ from mail order prices. WE SHIP THE SAME DAY ON MOST ORDERS! $40.00 min. purchase. *With prepaid cash orders

*Exclude certain printers & monitors & foreign orders.

Calif. residents add 6% State Tax.

For APO and FPO – add 10% ($25.00 min. for postage, Calif. residents add 6% Sales Tax). Include phone number, credit cards not accepted.

Foreign Orders – include 3% handling, shipped air freight collect credit cards not accepted.

COMPUTER SPECIALTIES

(714) 579-0330

MAIL TO: 1251 BROADWAY
EL CAJON, CA. 92021

CIRCLE 151 ON READER SERVICE CARD

Mathematical Analysis

A complete analysis of the problem requires consideration of three separate cases. They involve the alternate positions of the hunter relative to the monkey. The hunter can be on the ground below the monkey (case 1); at the same height above the ground as the monkey (case 2); or above the monkey (case 3).

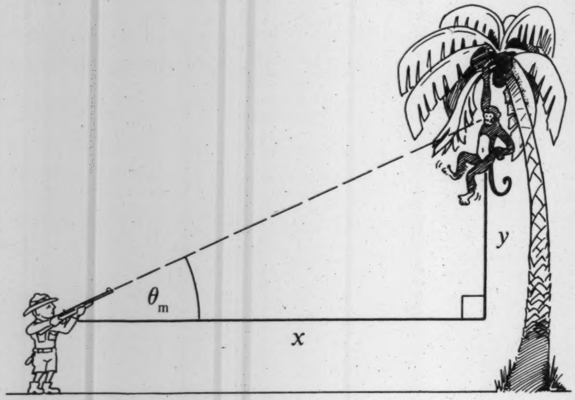


Figure 1

Consider first the case where the hunter stands below and facing the tree from which the monkey hangs. Let the height of the monkey above the ground be y, and the horizontal distance from the monkey to the hunter be x. The angle θ_m—the m represents the monkey—is the angle which the gun barrel must make with the ground in order to take direct aim at the monkey. Some simple geometry tells us that $\tan\theta_m = y/x$. The angle θ_m is just one of many possible aiming angles that the gun barrel could assume. However, it is the only angle which aims directly at the monkey.

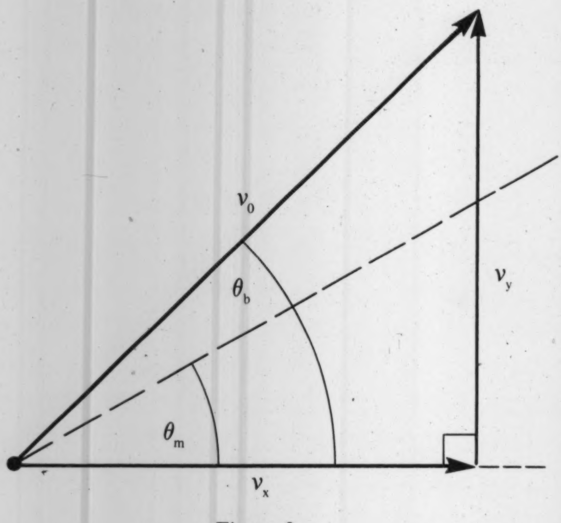


Figure 2

A closer look at the projectile motion at the vertex of the triangle occupied by the hunter and his gun shows that the gun and therefore the bullet could start out at any aiming angle. Call that aiming angle θ_b—here b is for bullet. In the vector diagram of Figure 2, the bold arrows represent vector quantities, possessed of both magnitude (their length) and direction (the way they're pointing). The vector v_0 represents the initial velocity vector for a bullet aimed at an angle θ_b. I should like to prove that only when $\theta_b = \theta_m$ can the bullet and the monkey meet.

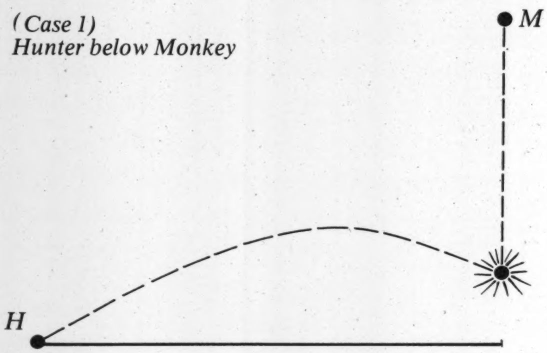


Figure 3

Imagine that the hunter and the monkey are confined to the first quadrant of a cartesian coordinate system. The hunter, located at H, is at the origin (0,0), while the monkey, at M, is at (x,y). Let (x_b,y_b) be the position of the bullet after t seconds and (x_m,y_m) the position of the monkey. The bullet and the monkey meet when $(x_b,y_b) = (x_m,y_m)$ at the same time t. The contention then is that this can only happen when $\theta_b = \theta_m$.

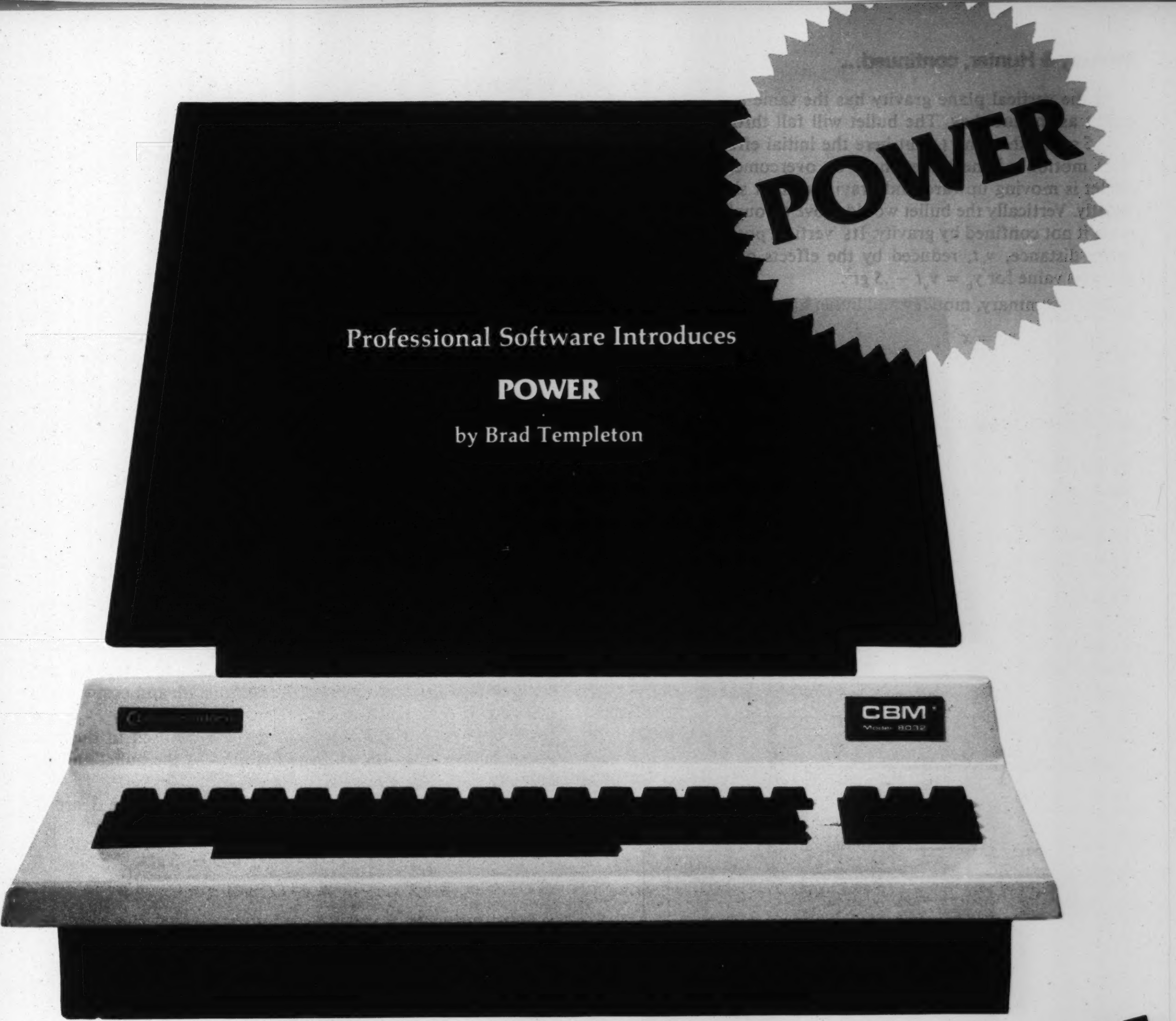
Now, $x_m = x$, since the monkey does not move horizontally. He is always the same horizontal distance, x, from the hunter. Vertically the monkey starts out y feet above the ground. An object which undergoes an acceleration a for a time t moves through a distance $s = .5\,at^2$. Here a is the acceleration due to gravity. Physicists usually use the variable g to represent the acceleration due to gravity. In the English system of measurement g has a value of 32 feet/sec^2. In the metric system it's value is 9.8 meters/sec^2. We will use the value 32 here. So $s = .5\,gt^2$. That's how far the monkey will fall in t seconds. So the altitude y must be reduced by the distance s to get the height of the monkey above the ground at any time t. This means that $y_m = y - .5\,gt^2$.

For the monkey then:

$$x_m = x \qquad\qquad y_m = y - .5\,gt^2$$

The Bullet

Now for the bullet. In Figure 2 the initial velocity of the bullet can be broken down into two components. One, v_x, moves the bullet horizontally. The other, v_y, moves the projectile only vertically. These motions are independent. The vertical speed of the bullet does not impact the horizontal motion one iota. Furthermore, the horizontal motion of the bullet does not reduce or increase its rate of rise and fall. Remember we are neglecting the friction of the air. So we can say from Figure 2 that $\tan\theta_b = (v_y/v_x)$. The bullet will move at a velocity of v_x in the horizontal direction. In doing so for t seconds it will travel a distance of v_xt. A simple *rate* × *time* relationship. The value of x_b, the abscissa of the bullet, is $x_b = v_xt$.



ADD POWER TO YOUR COMMODORE COMPUTER

$89.95

POWER produces a dramatic improvement in the ease of editing BASIC on Commodore's computers. POWER is a programmer's utility package (in a 4K ROM) that contains a series of new commands and utilities which are added to the Screen Editor and the BASIC Interpreter. Designed for the CBM BASIC user, POWER contains special editing, programming, and software debugging tools not found in any other microcomputer BASIC. POWER is easy to use and is sold complete with a full operator's manual written by Jim Butterfield.

POWER's special keyboard 'instant action' features and additional commands make up for, and go beyond the limitations of CBM BASIC. The added features include auto line numbering, tracing, single stepping through programs, line renumbering, and definition of keys as BASIC keywords. POWER even includes new "stick-on" keycap labels. The cursor movement keys are enhanced by the addition of auto-repeat and text searching functions are added to help ease program modification. Cursor UP and cursor DOWN produce **previous** and next lines of source code. COMPLETE BASIC program listings in memory can be displayed on the screen and scrolled in either direction. POWER is a must for every serious CBM user.

Call us today, for the name of the Professional Software dealer nearest you.

Professional Software Inc.
166 Crescent Road
Needham, MA 02194
Tel: (617) 444-5224   Telex #951579

CIRCLE 274 ON READER SERVICE CARD

In the vertical plane gravity has the same influence on the bullet as the monkey. The bullet will fall through a distance $s = .5\,gt^2$ in the time t. But here the initial effects of the vertical motion of the bullet must be overcome. After all the bullet is moving upward and gravity cannot slow it down instantly. Vertically the bullet would move through a distance $v_y t$ were it not confined by gravity. Its vertical position then is the latter distance, $v_y t$, reduced by the effects of gravity, $.5\,gt^2$, giving a value for $y_b = v_y t - .5\,gt^2$.

So, in summary, monkey and bullet have:

$$x_m = x \qquad y_m = y - .5\,gt^2$$
$$x_b = v_x t \qquad y_b = v_x t - .5\,gt^2$$

When will $x_m = x_b$ and $y_m = y_b$, i.e., when will the bullet and monkey share the same cartesian position? Clearly from the set of equations above, when $x = v_x t$ and $y = v_y t$. But this means that $(y/x) = (v_y t/v_x t) = (v_y/v_x)$. It is equally clear that $\tan\theta_m = (y/x)$, and that $\tan\theta_b = (v_y/v_x)$ and that, therefore, $\tan\theta_m = \tan\theta_b$. This can only happen when $\theta_m = \theta_b$. Thus proving the only way to hit the monkey is for the angle of aim, θ_b, to match the angle of elevation of the monkey, θ_m.

Case 2

For the second and third case I will give only a diagram and a derivation of the equations of position. The actual mathematical proof follows from case 1 very easily, so I will omit it.

(Case 2)
Hunter same altitude as Monkey

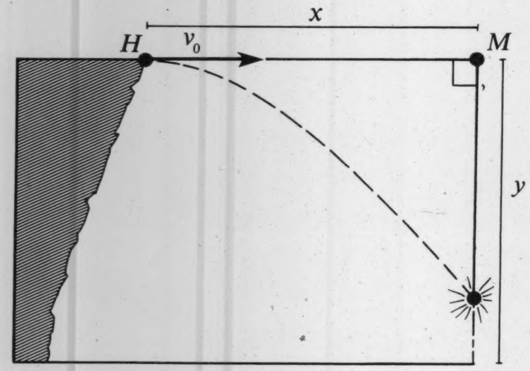


Figure 4

Here $v_0 = v_x$ and $v_y = 0$. The bullet and monkey fall at the same rate. They start from the same elevation and fall in unison. The fact that the bullet is moving horizontally and the monkey is not, has absolutely no bearing on the rate of descent of either.

So, for this case, the coordinates of position for both monkey and bullet are:

$$x_m = x \qquad y_m = y - .5\,gt^2$$
$$x_b = v_0 t \qquad y_b = y - .5\,gt^2$$

Case 3

The third case is a bit more complicated. Here the hunter is located z feet above the monkey who is y feet above the ground himself. So the hunter is $z + y$ feet above the ground.

(Case 3)
Hunter above Monkey

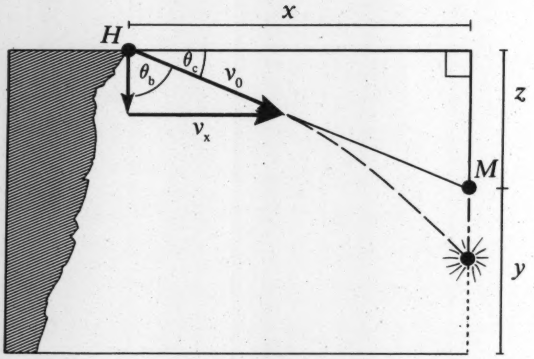


Figure 5

The angle θ_c is the aiming angle or the angle of depression. The vector diagram contains the original angle θ_b, which is the complement of θ_c. Thus, $\theta_b = 90° - \theta_c$. Further, $\tan\theta_c = (z/x)$, so $\theta_c = \tan^{-1}(z/x)$. Also, $\sin\theta_b = (v_x/v_0)$, and $\cos\theta_b = (v_y/v_0)$. This reverses the roll of sine and cosine from the vector diagram for case 1, where $\sin\theta_b = (v_y/v_0)$ and $\cos\theta_b = (v_x/v_0)$. These relationships will be used in the programs below to actually plot the motion of the bullet and the monkey.

In summary, the equations of position for case 3 are as follows:

$$x_m = x \qquad y_m = y - .5\,gt^2$$
$$x_b = v_x t \qquad y_b = (y + z) - v_y t - .5\,gt^2$$

Substituting, $v_x = v_0 \cdot \sin\theta_b$ and $v_y = v_0 \cdot \cos\theta_b$ gives:

$$x_m = x \qquad y_m = y - .5\,gt^2$$
$$x_b = v_0 \cdot \sin\theta_b \cdot t \qquad y_b = (y + z) - v_0 \cdot \cos\theta_b \cdot t - .5\,gt^2$$

The position equations from all three cases can be used to develop tabular evidence to support our contention. Finally slight modifications to each of the three programs, one for each case, allow plotting of the results. This provides more graphic empirical evidence that our mathematical proof is correct.

Tabular Approach

For case 1, I will show the results, not only of aiming directly at the monkey, but also of aiming above and below him. In all three instances it is useful to know how much time it takes for the bullet to reach the monkey. This allows a narrower slice of time to be examined. The analysis of the motion is then that much more detailed.

For case 1, $x_b = v_x t = v_0 \cdot \cos\theta_b \cdot t$ and so $t = x_b/(v_0 \cdot \cos\theta_b)$. The value for t that we wish to find is when the variable $x_b = x_m$, or when the bullet has reached the monkey. I have chosen values of 300 feet for x and 150 feet for y since these values fit nicely into the high resolution mode for the Atari 800 computer and with minor modification the TRS-80 Color Computer. Using the formula for time above, then, it is possible to compute the time in flight given the initial velocity, v_0, the angle of aim, θ_b, and the distance to the monkey, x. So use x for x_b if you want the total flight time, use x_b for itself if you want the time to reach the horizontal distance x_b from start.

IF YOU'RE WAITING FOR THE PRICE OF WORD PROCESSORS TO FALL WITHIN REASON,

IT JUST DID.
commodore
CBM
Model 8032
WordPro 4 PLUS
OFFICIALLY APPROVED COMMODORE DEALER

Everyone expected it would happen sooner or later...with WordPro PLUS™ it already has! Now all the marvelous benefits of expensive and advanced word processing systems are available on Commodore computers, America's largest selling computer line. WordPro PLUS, when combined with the new 80 column CBM 8032, creates a word processing system comparable to virtually any other top quality word processor available—but at savings of thousands of dollars!

New, low cost computer technology is now available at a fraction of what you would expect to pay. This technology allowed Commodore to introduce the new and revolutionary CBM 8032 Computer.

WordPro PLUS turns this new CBM 8032 Computer into a sophisticated, time saving word processing tool. With WordPro PLUS, documents are displayed on the computer's screen. Editing and last minute revisions are simple and easy. No more lengthy re-typing sessions. Letters and documents are easily re-called from memory storage for editing or printing with final drafts printed perfectly at over five hundred words per minute!

Our nationwide team of professional dealers will show you how your office will benefit by using WordPro PLUS. At a price far less than you realize.

Invest in your office's future...
Invest in WordPro PLUS...
Call us today for the name of the WordPro PLUS dealer nearest you.

Professional Software Inc.
166 Crescent Road
Needham, MA 02194
(617) 444-5224
TELEX: 95 1579

CIRCLE 277 ON READER SERVICE CARD

PROGRAM 2

```
100 PRINT
110 PRINT 'INPUT MUZZLE VELOCITY OF BULLET (TRY 200 TO
     START)';
120 INPUT V
130 X=300       @DISTANCE FROM TREE TO HUNTER
140 Y=150       @HEIGHT OF MONKEY ABOVE GROUND
150 G=32           @ACCELERATION DUE TO GRAVITY OF 32
     FT/SEC↑2
230 PRINT
240 PRINT 'SPECIFY START TIME, END TIME, INCREMENT'
250 INPUT B,L,N
260 PRINT
270 PRINT 'TIME','BULLET (X)','BULLET (Y)','MONKEY (X)','MONKEY
     (Y)'
280 PRINT
290 FOR T=B TO L STEP N
300 X2=X         @MONKEY'S X-POSITION AT TIME T
310 Y2=Y-(.5*G*T↑2)   @MONKEY'S Y-POSITION AT TIME T
320 X1=V*T    @BULLET'S X-POSITION AT TIME T
330 Y1=Y2   @BULLET'S Y-POSITION AT TIME T
340 PRINT T,X1,Y1,X2,Y2
350 IF Y2<0 THEN PRINT 'MONKEY LANDED SAFELY (TRY FASTER
     BULLET)'
360 IF Y2<0 THEN PRINT '(OR AIM MORE ACCURATELY!)'
370 IF Y2<0 AND Y1>=0 THEN 440
380 IF Y2>0 AND Y1<0 THEN PRINT 'BULLET HIT GROUND
     ';X-X1;'FT SHORT'
390 IF Y2>0 AND Y1<0 THEN 440
400 IF ABS(X1-X2)<1.1 AND ABS(Y1-Y2)<1.1 THEN PRINT 'YOU
     GOT HIM!'
410 IF ABS(X1-X2)<1.1 AND ABS(Y1-Y2)<1.1 THEN 440
420 NEXT T
430 PRINT 'YOU DID NOT HIT THE MONKEY IN THE TIME FRAME
     SCANNED!'
440 PRINT
450 PRINT 'DO YOU WANT TO TRY ANOTHER SET OF INPUTS
     (YES=0, NO=1)'
460 INPUT W
470 IF W=0 THEN 100
480 END
```

The table below shows a hit at 1.5 seconds, fully 114 feet off the ground.

```
INPUT MUZZLE VELOCITY OF BULLET
(TRY 200 TO START)? 200

SPECIFY START TIME, END TIME, INCREMENT
? 1.4,1.6,.01
```

TABLE 4
AIMING AT THE MONKEY (Case 2)

TIME	BULLET (X)	BULLET (Y)	MONKEY (X)	MONKEY (Y)
1.40	280	118.6400	300	118.6400
1.41	282	118.1904	300	118.1904
1.42	284	117.7376	300	117.7376
1.43	286	117.2816	300	117.2816
1.44	288	116.8224	300	116.8224
1.45	290	116.3600	300	116.3600
1.46	292	115.8944	300	115.8944
1.47	294	115.4256	300	115.4256
1.48	296	114.9536	300	114.9536
1.49	298	114.4784	300	114.4784
1.50	300	114.0000	300	114.0000

```
YOU GOT HIM!
```

Notice that monkey and bullet are always at the same altitude. They fall at the same rate. Remember the bullet was fired from a barrel which was perfectly parallel with the ground. The vertical component of the initial velocity is zero. All the power from the shell propels the bullet horizontally. Gravity alone influences the bullet in the vertical plane.

The situation will develop more slowly if a muzzle velocity below 200 feet/sec is used. However, something must happen before the monkey hits the ground, actually the bullet must be able to travel 300 horizontal feet. In this case both bullet and monkey fall 150 feet in 3.06 seconds. Since $150 = .5\,gt^2$, this means that $t^2 = (150/16)$ and $t = \sqrt{(9.375)}$; in that time the bullet must go 300 feet or more. With a muzzle velocity of 200 feet/sec it can go $200 \times 3.06 = 612$ feet. So a muzzle velocity as slow as $(300/3.06) = 98.05$ feet/sec would be enough to reach the monkey. Of course all these numbers change if the monkey is not 150 feet above the ground and/or 300 feet away.

Case 3

Program 3 below is used for the case when the hunter is above the monkey. An earlier diagram, Figure 5, gave the vertical distance between hunter and monkey as z.

PROGRAM 3

```
100 PRINT
110 PRINT 'INPUT MUZZLE VELOCITY OF BULLET (TRY 200 TO
     START)';
120 INPUT V
130 X=300       @DISTANCE FROM TREE TO HUNTER
140 Y=100       @HEIGHT OF MONKEY ABOVE GROUND
145 Z=50         @HEIGHT OF HUNTER ABOVE MONKEY
150 G=32           @ACCELERATION DUE TO GRAVITY OF 32
     FT/SEC↑2
160 T2=ATN(Z/X)*57.29578  @ANGLE OF DEPRESSION OF
     MONKEY IN DEGREES
170 PRINT
180 PRINT 'MONKEY IS BELOW AT AN ANGLE OF ';T2;' DEGREES
     FROM HUNTER'
190 PRINT
200 PRINT 'INPUT ANGLE OF DEPRESSION FOR FIRING ';
210 INPUT A
215 A=90-A     @FIND COMPLEMENT FOR ANGLE
220 A1=A/57.29578   @CONVERT TO RADIANS
230 PRINT
240 PRINT 'SPECIFY START TIME, END TIME, INCREMENT'
250 INPUT B,L,N
260 PRINT
270 PRINT 'TIME','BULLET (X)','BULLET (Y)','MONKEY (X)','MONKEY
     (Y)'
280 PRINT
290 FOR T=B TO L STEP N
300 X2=X          @MONKEY'S X-POSITION AT TIME T
310 Y2=Y-(.5*G*T↑2)   @MONKEY'S Y-POSITION AT TIME T
320 X1=V*SIN(A1)*T   @BULLET'S X-POSITION AT TIME T
330 Y1=(Y+Z)-(V*COS(A1)*T)-(.5*G*T↑2)  @BULLET'S Y-VALUE
     AT T
340 PRINT T,X1,Y1,X2,Y2
350 IF Y2<0 THEN PRINT 'MONKEY LANDED SAFELY (TRY FASTER
     BULLET)'
360 IF Y2<0 THEN PRINT '(OR AIM MORE ACCURATELY!)'
370 IF Y2<0 AND Y1>=0 THEN 440
380 IF Y2>0 AND Y1<0 THEN PRINT 'BULLET HIT GROUND
     ';X-X1;'FT SHORT'
390 IF Y2>0 AND Y1<0 THEN 440
400 IF ABS(X1-X2)<1.1 AND ABS(Y1-Y2)<1.1 THEN PRINT 'YOU
     GOT HIM!'
410 IF ABS(X1-X2)<1.1 AND ABS(Y1-Y2)<1.1 THEN 440
420 NEXT T
430 PRINT 'YOU DID NOT HIT THE MONKEY IN THE TIME FRAME
     SCANNED!'
440 PRINT
450 PRINT 'DO YOU WANT TO TRY ANOTHER SET OF INPUTS
     (YES=0, NO=1)'
460 INPUT W
470 IF W=0 THEN 100
480 END
```

HUNTINGTON COMPUTING

APPLE®

We stock almost 2,000 different products for the Apple, plus we special order others. Obviously, we can't list all we carry in the limited space we have here. Here is a sampling of what we carry. These are our **everyday prices** – not sale prices.

#9408	Self-Concept and Work	**$26.29**
#9669	Hodge Podge	**$16.89**
#3259	Apple Mechanic	**$24.99**
#6950	BPI General Ledger	**$335.69**
#1968	Star Blazer	**$25.39**
#1970	Chop Lifter	**$29.69**
#1971	Serpentine	**$29.69**
#9580	The Menu II (C&H)	**$33.89**
#7650	Pornopoly	**$25.39**
#7501	Financial Manag./Ck Writer (CMS)	**$55.19**
#7504	Financial Management III (CMS)	**$127.39**
#7368	SAMP (Conduit)	**$70.19**
#2560	Home Accountant	**$63.69**
#8480	Human Fly	**$25.39**
#9360	Menu Generator (Crane)	**$35.09**
#2030	Dinosaurs (Cross)	**$12.69**
#3108	MIRV (Dakin 5)	**$25.39**
#8907	Kids and the Apple (book)	**$17.99**
#9740	Volcanoes	**$43.49**
#6709	Physics/Free Fall (Ed Courseware)	**$28.09**
#6365	Critical Reading	**$35.99**
#1920	Algebra III	**$33.89**
#1913	Rendevous	**$33.89**
#8420	Apple Training Tapes (Fliptrack)	**$44.99**
#6452	Spanish Hangman	**$26.99**
#4951	H&H Auto Stock Tracker	**$254.99**
#6529	Clock (Hartley)	**$33.89**
#1164	Pie Writer (80-col.)	**$127.39**
#2453	The Tool	**$335.69**
#9010	The Wurst SALE	**$10.00**
#9012	Understand Yourself	**$24.95**
#9014	Computer Almanac	**$24.95**
#9882	Deadline	**$42.39**
#3652	Electric Duet	**$25.39**
#9060	Mathemagic	**$80.89**
#6380	Crossword Magic	**$39.99**

ALL MECC IN STOCK!!!!!!

#2260	SAT English I	**$25.49**
#1477	Castle Wolfenstein	**$25.39**
#1475	Robot Wars	**$33.89**
#1115	Marauder	**$29.69**
#6761	20,000 Leagues	**$29.69**
#1759	Graphics Magician	**$53.89**
#2181	Zoom Graphics	**$35.89**
#4252	Star Blaster	**$25.39**
#4206	German Vocab. Drill	**$21.19**
#2005	Bag of Tricks	**$33.89**
#860	R & H Super Fan	**$64.99**
#997	Cytron Master	**$33.89**
#998	Galactic Gladiator	**$33.89**
#1018	Pursuit of Graf Spree	**$50.89**
#1409	Graphics Combo Pack	**$101.79**
#9220	Quest for the Holy Grail	**$22.39**
#1220	Apventure to Atlantis	**$33.89**
#1213	Global PLE	**$55.19**
#1820	VisiCalc	**$199.00**
#5623	Apple Basic Data Files (book)	**$11.66**
#9121	Space Mouse	**$44.49**
#3501	Nykrom Super Diagnostics - (SALE)	**$55.00**
#8181	Bez-Man	**$19.49**
#115	A2D Joystick 2001	**$37.99**
#116	A2D Paddles	**$29.69**
#3112	Fantasy Combo	**$50.89**
#1975	Hardhat Noah	**$25.39**
#1972	HIRES #1 Deadly Secrets	**$29.69**
#8482	CPU Auto Atlas	**$40.29**
#8122	Word Race	**$21.19**
#4701	Pro Football	**$44.89**
#4700	Win at the Races	**$44.89**
#7960	Business Pack 100	**$89.89**
#8940	Exec. Briefing System	**$169.09**
#8560	Transend I	**$75.00**
#8562	Transend II	**$129.00**
#8260	Tai Pan	**$33.89**
#5209	Basic Conversions Handbook	**$7.09**
#5208	Softside Sampler (book)	**$7.99**
#5680	Nibble Express II (book)	**$11.59**
#8280	The Accountant (DSS)	**$109.59**

Softlights

By Fred Huntington

Holiday Greetings to all of you from the Huntington Gang. Here are some Holiday Specials that we hope will cheer up your day. Sale ends Dec. 31, 1982.

#4010	Elephant Disks .10/	**$19.99**
#4002	Verbatim Disks with plastic case .10/	**$25.99**
#93	MicroPrism Printer (IDS)	**$689.00**
#1084	Blade of Blackpoole (Sirius)	**$25.99**
#1070	Joyport (Sirius)	**$39.99**
#1085	Type Attack (Sirius)	**$28.00**
#861	Guardian Angel (R&H)	**$529.00**
#862	Super Fan II/Zener Ray (R&H)	**$94.00**
#860	Super Fan II (R&H)	**$59.00**
#1974	Seafox (Broderbund)	**$22.00**
#1975	Hard Hat Noah (Broderbund)	**$22.00**
#12	Mimco Joystick	**$53.99**
#2072	Shootout at the O.K. Galaxy (A-H) Disk	**$19.00**
#7020	Federation (A-G)	**$24.00**
#8181	Bez-Man	**$26.00**
#8915	Crazy Mazey (Datamost)	**$24.00**
#8916	Mars Cars (Datamost)	**$24.00**
#8917	Money Muncher (Datamost)	**$24.00**
#8918	Vortex (Datamost)	**$24.00**
#8123	Software Auto Mouth (Don't Ask)	**$99.00**
#1935	Prisoner II (Edu-Ware)	**$27.00**
#8919	Pandora's Box (Datamost)	**$24.00**
#8121	Claim to Fame (Don't Ask)	**$15.00**
#7270	Juggles Rainbow (Learning Co.)	**$35.00**
#7273	Gertrude's Secrets (Learning Co.)	**$59.00**
#7275	Rocky's Boots (Learning Co.)	**$59.00**
#9017	GGH Lower Case Adaptor	**$15.00**
#1133	Pest Control (Sierra On-Line)	**$24.00**
#1135	Lunar Leeper (Sierra On-Line)	**$24.00**
#1950	Comp. Graph. System (Penguin)	**$49.00**
#6208	Astro Quote (PDI)	**$18.00**
#2918	B.E.S.T. (Sensible)	**$29.00**
#1082	Free Fall (Sirius)	**$24.00**
#1083	Way Out (Sirius)	**$24.00**
#4801	Executive Secretary (SOF/SYS)	**$199.00**
#1467	Super Text 40/56/70 (Muse)	**$99.00**
#7230	Snooper Troops #1 (Spinnaker)	**$36.00**
#7232	Story Machine (Spinnaker)	**$27.00**
#1607	D.B. Master (Stoneware)	**$159.00**
#996	S.E.U.I.S. (SSI)	**$28.00**
#998	Galactic Gladiators (SSI)	**$28.00**
#1019	Guadalcanal (SSI)	**$44.00**
#995	The Cosmic Balance (SSI)	**$28.00**
#2310	Bug Battle (USA)	**$17.00**

ATARI SOFTWARE

We have a very large selection of Atari software. Call us. Most everything sells for 15% below list. My two current favorites are Pacific Coast Highway and Preppie.

ABOUT PRICES

Because of the early deadlines for our magazine ads, our ads do not always reflect the manufacturer's current prices. So, in order to stay in business, we have to raise our prices when they are raised to us.

So when you call, please have the order taker verify the prices you think you are paying. On mail orders, we will check with you before charging you the higher price. We sometimes make mistakes, but we'll always do our best to correct these mistakes.

OLDIES

We stock a very large number of computer classics that your local computer store probably no longer carries. We carry such oldie goldies as Beneath Apple Manor, Fastgammon, Wilderness Campaign, Phantoms Five, Tranquility Base, Apple '21', Galaxy Wars, and many, many others, all at a discount.

RANA DISK DRIVES

Yes, we stock those sensational new Rana Disk drives. We're not allowed to put our low prices in print so give us a call and we promise to please you.

ATARI®

You can always tell which things we sell for Apple and which are for Atari. All Apple prices end in a "9" and all Atari prices in a "4". For example, a $30 game would cost $25.44 for Atari and $25.39 for the Apple.

All APX, including Eastern Front, Attank!, Wordmaker, Number Blast, 747 Landing Simulator, and many more available at 15% off list price (most available in cassette and disk).

#1300	The I Ching (Alternate Reality Software)	**$39.00**
#855	Hodge Podge	**$16.84**
#257	Pacman	**$38.14**
#290	Caverns of Mars	**$33.94**
#290	Centipede	**$38.14**
#277	Star Raiders	**$38.14**
#1020	Raster Blaster	**$26.94**
#658	Pornopoly	**$25.44**
#920	Kayos (disk)	**$30.74**
#742	Darts/Tilt	**$21.94**
#373	Shooting Arcade (disk)	**$25.44**
#371	Clowns and Balloons (disk)	**$25.44**
#362	Pacific Coast Highway (disk)	**$25.44**
#370	Pacific Coast Highway (cass.)	**$25.44**
#369	Canyon Climber (disk)	**$25.44**
#880	Pool 1.5	**$30.74**
#1210	Alien Swarm (disk)	**$29.64**
#1080	Deadline	**$42.44**
#980	K-razy Shootout (cart.)	**$42.44**
#1270	Mastertype	**$33.94**
#481	Letter Perfect	**$127.44**
#1100	Megalegs (cass.)	**$29.64**
#468	Frogger	**15% off list**
#461	Wizard and the Princess (disk)	**$27.94**
#460	SoftPorn Adventure (disk)	**$26.34**
#560	Ali Baba (disk)	**$28.94**
#1171	Deluxe Invaders (cart.)	**$33.94**
#1143	Cyclod (disk)	**$25.44**
#1141	Space Eggs	**$25.44**
#1192	Black Forest (disk)	**$21.14**
#1191	Ghostly Manor (disk)	**$21.14**
#1190	Adv. on a Boat (disk)	**$21.14**
#671	Dodge Racer (disk)	**$25.44**
#661	Dodge Racer (cass.)	**$19.04**
#670	Shamus (cass.)	**$25.44**
#669	Shamus (disk)	**$25.44**
#668	Nautilus (cass.)	**$25.44**
#667	Nautilus (disk)	**$25.44**
#666	Chicken (cass.)	**$25.44**
#665	Chicken (disk)	**$25.44**
#664	Protector (cass.)	**$25.44**
#663	Protector (disk)	**$25.44**
#662	Disk Manager (disk)	**$25.39**
#660	File Manager 800 (disk)	**$80.24**
#501	VisiCalc (disk)	**$199.00**

Much, much more Atari in Stock

Generic Computer Games (disk)

(Apple #8109)

$9.99

Dealer inquiries tolerated

Call Toll-Free 800-344-5106 (outside California)

HUNTINGTON COMPUTING
Post Office Box 1297
Corcoran, California 93212

Foreign Orders 209-992-4481
In California 800-692-4146

Apple™ is a registered trademark of Apple Computer, Inc.
Atari™ is a registered trademark of Atari, Inc.

Outside Calif. 800-344-5106

We take **MasterCard, American Express or VISA** (Include card # and expiration date). California residents add 6% tax. Include $2.00 for postage. Foreign and hardware extra. Foreign (excluding Canada): remit U.S. currency, checks on U.S. banks, use listed charge cards, or make direct wire transfers through Security Pacific Bank, Corcoran, for a $6.00 charge. All overseas orders shipped by air. Send for free catalog. Prices subject to change without notice.

CIRCLE 205 ON READER SERVICE CARD

In the program I've changed the value of *Y* to 100, and allowed *Z* to be 50, so that the entire scene will fit into a 160 × 300 pixel graphics layout. This is sufficient for the Atari 800 using graphics mode 8. The TRS-80 Color Computer will require a horizontal reduction to about 250 pixels.

Line 160 reflects the revised formula for computing the aiming angle in degrees. We use Z instead of *Y*. Line 215 takes the complement of the aiming angle because the vector diagram given in Figure 5 clearly shows that $A = \theta_c$ is not within the vector triangle. *A1* represents θ_b in radians in all subsequent calculations in the program. Lines 300-330 contain the formulas for case 3 developed earlier.

```
INPUT MUZZLE VELOCITY OF BULLET
(TRY 200 TO START)? 200

MONKEY IS ELEVATED AT AN ANGLE OF
9.4623222 DEGREES FROM HUNTER

INPUT ANGLE OF ELEVATION FOR FIRING? 9.462

SPECIFY START TIME, END TIME, INCREMENT
? 1.5,1.6,.01
```

TABLE 5
AIMING AT MONKEY (Case 3)

```
TIME   BULLET (X)   BULLET (Y)   MONKEY (X)   MONKEY (Y)
1.50   295.91817    64.680298    300          64
1.51   297.89096    63.869901    300          63.5184
1.52   299.86374    63.056303    300          63.0336
YOU GOT HIM!
```

The run above shows only the case where we take aim directly at the monkey. The monkey is hit 1.52 seconds or so after firing.

Graphics Modifications

If you have a TRS-80 Color Computer with Extended Color Basic add the following commands to any of the three previous programs. The trajectories of both monkey and bullet will then be visible.

```
130    X = 250
140    Y = 150
252    PMODE 4,1
253    PCLS
254    SCREEN 1,1
255    COLOR 5,7
335    Y1 = ABS(Y1 - 150)
337    Y2 = ABS(150 - Y2)
340    PSET (X1,Y1):PSET (X2,Y2)
350    IF ABS(X1 - X2)<1 AND ABS(Y1 - Y2)<1
       THEN SOUND 100,3
425    FOR U = 1 TO 5000:NEXT U
```

Delete lines 360, 370, 380, 390, 400 and 410. Add your own tests for a hit using the graphics features available on your machine.

Line 130 changes the horizontal distance to 250 feet since the TRS-80 has only 256 × 192 pixels in high resolution graphics mode. Line 252 selects graphics mode 4—highest resolution—and starts on memory page 1. Line 253 clears the screen in graphics mode. Line 254 activates the graphics mode and cancels the text mode. It also selects color set 1. Line 255 establishes the colors.

Lines 335 and 337 are needed because of a quirk in the way most micros label screen locations. The origin, (0,0), is located in the *upper* left corner of the screen because of the order in which the TV raster lines are scanned. To move the origin to the *lower* left and still retain positive coordinate values—as we expect in a first quadrant graph—we must compute the difference between 150 and the point to be plotted. The absolute value is taken to ensure that only positive values are plotted.

Line 340 actually plots the points. Be sure to include the parentheses. Line 350 produces a short beep when the objects collide. Line 425 keeps the graph on the screen for 20 seconds or so.

Atari 800

If you have an Atari 800 the modifications to the first three programs would then go something like this:

```
130    X = 300
254    GRAPHICS 8:COLOR 1
256    SETCOLOR 2,1,14
335    Y1 = ABS(Y1 - 150)
337    Y2 = ABS(150 - Y2)
340    PLOT X1,Y1:PLOT X2,Y2
```

The Atari resolution is 320 × 160 in graphics mode 8, so we set *X* back to 300 in line 130. Lines 254 and 256 establish the color set and call the high resolution graphics mode with a four line text window at the bottom of the screen. If you establish your own test for a hit delete lines 360-410. Then add some sound effects as I did for the TRS-80. The Atari sound command is a little different. Note that the commands to plot the points, line 340, have no parentheses.

The points may appear faint on your color TV so be prepared to adjust color, tint and/or brightness. The graph appears clearly on a black and white set.

In both micro modifications I have given only the barest essentials required to see the points and experiment with various trajectories and muzzle velocities. Readers are encouraged to embellish these graphs. Here the monkey is just a series of points. He could be made more real, in a lower resolution mode. The time and location parameters could be displayed on the screen or in the text window as the action develops. Maximum height, range and time in flight can easily be computed from the formulas which I have given earlier.

Make Your Own Game

If a friend is allowed to control the monkey's drop, a two player game can be developed. Joystick or paddle could be used to establish aiming points and firing angles. Soon it becomes apparent that if you root for the monkey, you might advise him to stay put. If you assume a smart hunter is always aiming at the monkey, the bullet will drop below the monkey, if he doesn't let go as the bullet is fired. Unless of course, the muzzle velocity is extremely fast. In that case the monkey would be struck only inches from the branch. In fact, the monkey would be struck even if he didn't let go at very high muzzle velocities. Aiming at his chest, for example, might result in a direct hit on his *belly-button*. The bullet will drop only slightly at high muzzle velocities.

Summary

In short, this can be a useful starting point for user written games and programs where missiles and other projectiles are part of the action. The realism of gravitational influences are easy to build, when you understand a little of the physics at work.

Happy Hunting! ☐

ONE MAGAZINE CAN'T COVER IT ALL

THE
SOFTWARE
HARDWARE
BUSINESS
ADVANCED SYSTEMS
COMPUTER
MAGAZINE

THESE FOUR MAGAZINES DO!

Ziff-Davis Publishing Company is proud to introduce its ZD Computer Magazine Group.
Here are the leading magazines in four widely separate areas of computing—
pick the one that meets your needs and subscribe today at savings up to 25%!

■ SOFTWARE

Creative Computing is number one for software and applications information. You'll find reviews of software for all microcomputer systems, evaluations of personal computers and peripherals, book reviews and games to play. Plus helpful shortcuts, new products, and plenty of ways to have fun with your microcomputer! **SAVE 20%!**

■ HARDWARE

More people depend upon *Computers & Electronics* (formerly *Popular Electronics*) for microcomputer hardware information than *any* other magazine. You get the latest news on computing, plus advice on choosing microcomputers, peripherals and accessories. Also features on home electronics, communications, etc. **SAVE 19%!**

■ BUSINESS USES

If you're in business, sooner or later you'll need a microcomputer. *Small Business Computers* reports on (and evaluates) all the new microcomputers and operating systems for business use. You get detailed information on applications and software for finance, marketing, sales, distribution, purchasing and word processing. **SAVE 25%!**

■ ADVANCED SYSTEMS

If you're already an expert with microcomputers, you need *Microsystems,* the journal for advanced users. *Microsystems* covers new languages. Advanced hardware and software products. Tutorials on modifications and special uses of systems. Techniques for interfacing. Plus other current information on DOS development. **SAVE 20%!**

ZD COMPUTER MAGAZINE GROUP
CN 1935, Morristown, New Jersey 07960

YES! Enter my subscription(s) for the following magazines:

Creative Computing
I SAVE 20%!
Computers & Electronics
I SAVE 19%!

☐ CREATIVE COMPUTING
12 issues
for $19.97.
Saving based on
full subscription
price of $24.97.

☐ COMPUTERS & ELECTRONICS
12 issues
for $12.97.
Saving based on
full subscription
price of $15.97.

Mr./Mrs./Ms.____________________
(please print full name)
8H914

Company____________________

Address____________________

City__________State________Zip________

CHECK ONE: ☐ Payment enclosed.
(Make check payable to
ZD Computer Group.)
☐ Bill me later.

Please allow 30 to 60 days for delivery of first issue.
Offer valid in U.S. and possessions only.

☐ SMALL BUSINESS COMPUTERS
12 issues
for $14.97.
Saving based on
full subscription
price of $19.97.

☐ MICROSYSTEMS
12 issues
for $19.97.
Saving based
on full
subscription
price of $24.97.

SMALL BUSINESS COMPUTERS
I SAVE 25%!
Microsystems
I SAVE 20%!

Creating A Hole In Applesoft Basic

M. J. Parrott

From time to time it can be useful to leave a space within a Basic program to incorporate perhaps a machine code program or a data space. This is also true for a special reason on the Apple II when one wishes to protect the hi-res pages from program text.

The usual way around this particular problem is to load the Basic text above the hi-res pages either by changing the beginning of program pointer ($67,68) before loading it (usually in an EXEC file) or by letting the program relocate itself to above the hi-res page when it RUNs by using a utility such as the &LOMEM: developed by Neil Konzen (Apple Orchard, March 1980, p. 21).

The drawback with loading a program above the hi-res pages is that approximately 6K of memory is left fallow; it can only be used for machine code routines or shape tables. Also the &LOMEN: utility does not work for very long programs because of the way in which it calculates the new link addresses of the relocated text.

It is desirable therefore to be able to load a program at the normal starting location ($801), to continue up to the area of memory to be protected (this is $2000 to $4000 for hi-res page 1 and $2000 to $6000 for hi-res pages 1 and 2 together), to jump over this area of memory and to continue up to the end of program text.

This is actually quite easy to do, and the program listed will allow you to do it without problem. In essence the only work required is to move the latter part of the program and to change the link addresses where required. There are, however, a couple of provisos, but before pointing these out it is probably best to discuss the general construction of an Applesoft Basic program.

When you type a Basic program it is constructed from memory location $801 (2049) upwards. Memory location $800 will contain a zero value. The actual line of Basic you type in is not stored exactly as you type it. If you call the monitor (CALL-155) and type 800L you can examine the start of any program you have previously typed in or LOADed. The first two bytes of the line are the link address. In reverse order, these point to the start of the next line of Basic. Perhaps the best way of demonstrating this is with an example such as the short program:

```
10 PRINT "HELLO"
20 GO TO 10
```

If you type this in, call the monitor and type 800.817, and press RETURN you will see the following:

```
0800- 00  0E  08  0A  00  BA  22  48
0808- 45  4C  4C  4F  22  00  16  08
0810- 14  00  AB  31  30  00  00  00
```

The values 0E,08 are the link addresses for line 10. They point to location $80E where line 20 starts. At this location appear the link addresses for this line, they point to $816 where you will find the values 00,00. This is how Applesoft knows it has reached the end of a program.

Going back to the first line, the next two locations contain the line number expressed as a hexadecimal number stored in two bytes in reverse order, i.e. 0A 00 for the decimal value 10. Next follows the text of the line. The command PRINT appears as a single byte in the tokenized form BA. There then follow seven bytes which spell out HELLO in standard ASCII (with the high bit set low). Next is the end of line token, a zero byte.

The next line has its link addresses, its line number, and the tokenized form of GO TO which is AB, followed by the number of the object line stored as ASCII values. Then come the end of line token (O) and the two zero value link addresses which signify the end of the program.

In general then, any line of Basic is sandwiched between two zero bytes. This is the first proviso on relocating part of the program: the second part must start with a zero byte so that it looks like a normal line of Basic to Applesoft.

The second proviso is that the last line of the first part of a split program must be

---

M. J. Parrott, 23 Brackley Road, Heaton Chapel, Stockport, Cheshire SK4 2QT, England.

one that does not simply move on to the next line (because it isn't there). In other words, this last line must be either a GO TO or a RETURN.

If these two conditions are met, and the link addresses are adjusted after splitting, then a program will run quite normally as long as the end of program pointer ($AF,BO) is adjusted and from it the pointers to variables, arrays, and strings are also reset.

If the program is SAVEd, however, in its split form, everything will be there on a subsequent LOADing, but the program will only LIST up to the end of the first part, and it will not RUN correctly. The reason is not hard to find. All the link addresses are correct except for those in this last line. Therefore a split program must POKE in the two "wrong" link addresses when it begins to execute.

There is another annoying thing about a split program saved to disk: there is a waste of disk space. In the case of a program split around one hi-res page, 34 sectors are lost, and a massive 68 are lost for two hi-res pages. It is true that this space can be used to keep a hi-res picture for either introducing the program or starting it off, but generally I would rather save the disk space.

Now for some time, because I use many longish programs with big arrays and graphical output, I have been splitting Basic programs around the hi-res pages using two small machine code programs. The first of these two programs listed the link addresses of a Basic program in memory and on choosing a convenient location at which to start the split it gave me the decimal equivalent (for POKEing purposes) and the corresponding line number (so I could change this line to a GOTO the next if necessary).

The second program then actually split the Basic program for me using data that I passed to it so it knew to where to split and from where. I was quite happy with this system although it was a little clumsy to use until I began to worry about the lost disk space, and until friends who were also interested in splitting programs complained about the complicated procedure required.

It suddenly occurred to me one night that Neil Konzen had the right idea when he incorporated his relocating routine within the body of the program itself. Clearly it would be better to let the Basic program be split after LOADing and RUNning, and also it should all be as automatic as possible. Thus was born the &CLEAR...TO... utility.

HONK! BEEP! SHPOP! ZOT! BZZZZ!
BLOOP!
MMMMM! BOP!
BRR! WHRRRR!
MY BROKER IS IBM. AND IBM SAYS...
①
??
??
②

There are two ways of using the utility. One is to let the Applesoft program listed assemble the machine code program for you in memory and then save it to disk. Then, when used, the machine code program is merely BRUNned from within the Basic program. The second is to incorporate the listed Applesoft program within your own program and CALL the machine code routine after it has been POKEd in.

After the routine is BRUNned or CALLed, the area of memory to be kept clear is merely passed to it as two decimal values. These need not be simple numbers; they can be expressions. For example to clear the area of memory required for two hi-res pages a line of Basic such as

```
1 PRINT CHR$(13)+CHR$(4)“BRUN
CLEARSPLIT”:&CLEAR 2*16*256 TO
6*16*256
```

will accomplish the split as long as the binary file CLEARSPLIT is on the disk.

As long as the lower area is cleared first, a second or third area can also be cleared merely by invoking the appropriate &CLEAR..TO.. line. The utility can also be used in the immediate mode as long as it is BRUNned first. Thus, a program can be split and saved in the split form as long as a line of Basic is incorporated to POKE in the two link addresses as explained above. (You will have to determine the exact values after incorporating the line by either going through the memory following the link addresses yourself or by using a small program as described above).

The utility can also be used to relocate completely a program above the hi-res page as in Neil Konzen's &LOMEM: utility but without the worry of losing part of a long program. This is accomplished by using the lines

```
1 PRINT CHR$(13)+CHR$(4)“BRUN
CLEARSPLIT”: &CLEAR 1024 TO
16384
2 POKE 104,64 :REM for page one
```

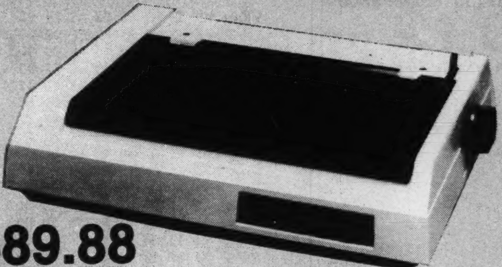
Five points are worth noting when using the &CLEAR..TO.. utility. The first is that it must be used early in a program before any of your variables or strings are defined since it does a CLEAR before returning to the Basic. The second is that it does not protect itself by resetting HIMEM: so it will be overwritten by any string activity. The third is that the line number corresponding to the first line in the latter part will be displayed on the screen. The fourth is that an attempt to set an initial value not within the program will result in an error message, as will the wrong syntax in the line. The fifth is that after splitting, a program cannot be edited.

Hole in Applesoft, continued...

Listing 1. Source code for CLEAR-SPLIT, the program that breaks a Basic program into two pieces.

```
        ORG  $9400
ADDRS   EQU  $50
TEMP    EQU  $5E
AMPSND  EQU  $3F5
SYNCHK  EQU  $DEC0
FRMNUM  EQU  $DD67
GETADR  EQU  $E752
STRING  EQU  $ED20
PRGBEG  EQU  $67
VARPNT  EQU  $69
CURLIN  EQU  $75
HIGHDS  EQU  $94
HIGHTR  EQU  $96
LOWTR   EQU  $9B
PRGEND  EQU  $AF
FBUFFR  EQU  $100
BLTU    EQU  $D393
CLEAR   EQU  $D66C
ERROR   EQU  $D412
********************
*
* &CLEAR...TO...
*
*
********************
        LDA  #$4C       ;SET UP &-VECTOR
        STA  AMPSND
        LDA  #>LOMEM
        STA  AMPSND+1
        LDA  #<LOMEM
        STA  AMPSND+2
        RTS
********************
FROM    DS   2
TO      DS   2
LOMEM   LDA  #$BD       ;THE CLEAR TOKEN
        JSR  SYNCHK     ;IS NEXT CHAR CLEAR?
        JSR  FRMNUM     ;GET ADDRESS FROM WHICH TO SPLIT
        JSR  GETADR     ;PUT IT IN ADDRS
        LDA  ADDRS      ;TRANSFER IT TO TEMP STORAGE
        STA  FROM
        LDA  ADDRS+1
        STA  FROM+1
        LDA  #$C1       ;THE TO TOKEN
        JSR  SYNCHK     ;IS NEXT CHAR TO
        JSR  FRMNUM     ;GET ADDRESS TO WHICH TO GO
        JSR  GETADR     ;PUT IT IN ADDRS
        LDA  ADDRS
        STA  TO
        LDA  ADDRS+1
        STA  TO+1
        CLD
        LDY  #$01       ;CHECK THERE IS A PROGRAM
        LDA  (PRGBEG),Y ;IN MEMORY
        BNE  OKAY
ERR     JMP  ERROR
OKAY    SEC              ;WE HAVE TO KEEP AT LEAST
        LDA  FROM       ;11 BYTES FOR THE NEW LINE
        SBC  #$B        ;TO BE CREATED
        STA  FROM
        BCS  ADDED
        DEC  FROM+1
ADDED   LDA  PRGBEG     ;SET POINTER TO LINK
        STA  ADDRS      ;ADDRESSES AND
        STA  TEMP       ;TEMP STORAGE
        LDA  PRGBEG+1
        STA  ADDRS+1
        STA  TEMP+1     ;TEMP STORAGE
LOOP    LDY  #$01        ;SEARCH THROUGH BASIC
        LDA  (ADDRS),Y ;CHECKING LINK ADDRESSES
        BEQ  ERR        ;ZERO BYTE IS END OF PROG
        CMP  FROM+1     ;UP TO FROM YET?
        BEQ  HIFND      ;GO CHECK LO BYTE
        BCS  CONT       ;DONT CHANGE HI BYTE
        STA  TEMP+1     ;TEMP STORAGE
        DEY
        LDA  (ADDRS),Y ;GET LO BYTE OF LINK
NOTYET  STA  ADDRS
        STA  TEMP       ;TEMP STORAGE
        LDA  TEMP+1
        STA  ADDRS+1    ;RESET LINK POINTER
        BCC  LOOP
HIFND   STA  LOWTR      ;TEMP STORAGE FOR HI BYTE
        DEY
        LDA  (ADDRS),Y ;GET LO BYTE
        CMP  FROM
        BCS  CONT       ;BIGGER? THEN GO ON
        TAX              ;TEMP STORAGE FOR LO BYTE
        LDA  LOWTR      ;GET HI BYTE
        STA  TEMP+1     ;TEMP STORAGE
        TXA              ;REGET LO BYTE
        BCC  NOTYET
CONT    SEC
        LDA  TEMP       ;GET OLD LO BYTE OF LINK
        SBC  #$01       ;SET POINTER TO 0 BYTE BEFORE THE LINE
        STA  LOWTR      ;SET UP BLTU POINTER
        LDA  TEMP+1
        SBC  #$00
        STA  LOWTR+1
        CLC
        LDA  PRGEND
        ADC  #$01       ;BLTU WANTS NEXT LOC
        STA  HIGHTR
        BCC  CONT2
        INC  PRGEND+1
CONT2   SEC              ;CALC NO OF BYTES
        SBC  LOWTR      ;TO MOVE
        STA  FROM       ;AND STORE IT IN FROM
        LDA  PRGEND+1   ;AND FROM+1
        STA  HIGHTR+1
        SBC  LOWTR+1
        STA  FROM+1
        CLC
        LDA  FROM       ;CALC NEW PRGEND
        ADC  TO         ;AND VECTORS
        STA  HIGHDS     ;FOR BLTU
        STA  PRGEND
        STA  VARPNT
        TAX
        LDA  FROM+1
        ADC  TO+1
        STA  HIGHDS+1
        STA  PRGEND+1
        STA  VARPNT+1
        TAY              ;FOR BLTU
        TXA              ;FOR BLTU
        JSR  BLTU       ;MOVE THE LATTER HALF
        LDA  CURLIN     ;TEMP STORAGE FOR CURRENT
        PHA              ;LINE NUMBER
        LDA  CURLIN+1
        PHA
        LDY  #$03
        LDA  (LOWTR),Y ;GET LINUM TO
        STA  CURLIN     ;CHANGE IT TO A
        INY              ;STRING
        LDA  (LOWTR),Y
        STA  CURLIN+1
        JSR  STRING
        PLA              ;RESTORE CURRENT LINE
        STA  CURLIN+1   ;NUMBER
        PLA
        STA  CURLIN
        LDY  #$03       ;NOW DECREASE LNUM
        LDA  (LOWTR),Y ;BY 1 FOR NEW LINE
        SEC
        SBC  #$01
        STA  (LOWTR),Y
        INY
        LDA  (LOWTR),Y
        SBC  #$00
        STA  (LOWTR),Y
        LDY  #$05
        LDA  #$AB       ;THE GOTO TOKEN
        STA  (LOWTR),Y
        LDX  #$FF
LINE    INX
        LDA  FBUFFR,X
        INY
        STA  (LOWTR),Y
        CMP  #$00
        BNE  LINE
        CLC
        LDA  LOWTR
        ADC  #$01       ;ADJUST POINTER TO LINK ADD.
        STA  LOWTR
        BCC  LINK
        INC  LOWTR+1
LINK    CLC
        LDA  #$01       ;NOW CHANGE LINK ADDRESSES
LOOP2   ADC  TO
        LDY  #$00
        STA  (LOWTR),Y
        STA  TO
        PHA              ;TEMP STORAGE
        BCC  CONT5
        INC  TO+1
CONT5   LDA  TO+1
        INY
        STA  (LOWTR),Y
        STA  LOWTR+1
        PLA              ;RESET LOWTR TO NEXT
        STA  LOWTR
        LDA  (LOWTR),Y
        BEQ  DONE       ;ZERO BYTE IS END OF PROG
        LDY  #$04        ;SKIP LNUMS
LOOP1   INY
        LDA  (LOWTR),Y
        CMP  #$00       ;LOOK FOR EOL
        BNE  LOOP1
        INY
        TYA
        CLC
        BCC  LOOP2
DONE    JMP  CLEAR      ;LET APPLESOFT DO THE REST
```

IDS MICROPRISM



$689.88

UPS Delivered

- 110 cps bi-directional, logic-seeking
- Single pass correspondance quality print
- 10, 12, & 16 cpi with extended mode (24 x 9 dpi)
- 84 x 84 dpi Dotplot graphics; 1/48" line space

Okidata Printers

MICROLINE 82A	$439.00
ML82A TRACTOR	$59.00
MICROLINE 83A	$694.00
OKIGRAPH ROM	$44.00
MICROLINE 84 Parallel 200 cps	$1044.00
MICROLINE 84 RS-232C 200 cps	$1169.00

Anadex Printers

DP-9500A	$1474.00
DP-9510A	$1474.00
DP-9620A	$1569.00

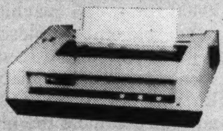
Brother Printers

DAISYWRITER 2000	$1089.00
TRACTOR	$49.00
CABLE	$149.00

IDS Printers

PRISM 80 W/4-colors, Sprint Mode, Dot Plot, & Cut Sheet Guide	$1329.00
PRISM 80 w/o color	$1174.00
PRISM 132 W/4-colors, Sprint Mode, Dot Plot, & Cut Sheet Guide	$1699.00
PRISM 132 w/o color	$1254.00

TEC Printers



DMP85	$469.00

The generic version of NEC & Prowriter printers. Features 120 cps, bi-directional, logic-seeking, 1.3K buffer. 5 fonts, 8 sizes on 9x9 matrix, w/proportional print, true descenders, & Greek/Math font. 160 x 144 dots/inch Hi-Res graphics matrix, 1/144" line feed. Friction & tractor standard, rear paper path.

C. Itoh Printers

C. ITOH PROWRITER	$499.00
C.ITOH PROWRITER Parallel & RS-232C	$619.00
C. ITOH PROWRITER 2	$734.00
C.ITOH PROWRITER 2 Parallel & RS-232C	$799.00
C. ITOH F-10/40 STARWRITER Parallel, 40 cps	$1499.00
C. ITOH F-10/55 PRINTMASTER Parallel, 55 cps	$1799.00
F-10 TRACTOR	$289.00

NEC Printers

NEC PC 8023A-C	$509.00
NEC 3530 (35cps)	$1809.00
NEC 7730 (55 cps)	$2579.00

Centronics Printers

CENTRONICS 122-1	$979.00
CENTRONICS 352	$1614.00
CENTRONICS 353	$2274.00
CENTRONICS 739-1	$659.00

Smith-Corona

SMITH CORONA TP-1	$599.00

Specify 10 or 12 cpi
Specify Parallel or RS-232C

Call For Prices

On QUME & DIABLO Daisywheels. QUANTEX, DATASOUTH, DIP, MPI, & other printers available

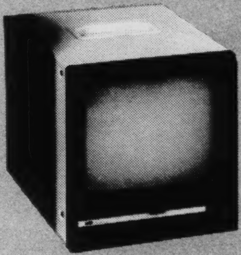
Hayes Smartmodem

HAYES SMARTMODEM	$229.00
HAYES 1200 BAUD SMARTMODEM	$574.00

MODEMS

SIGNALMAN MARK I	$89.00
NOVATION AUTO CAT	$224.00
NOVATION 1200 BAUD AUTO CAT	$569.00

USI Pi Series



PI-3 (12" AMBER)	$199.00
PI-4 (9" AMBER)	$169.00

20 MHz bandwidth, 1000-line-at-center resolution, 80 columns by 24 lines—the USI Pi-3 with amber screen redefines quality. Amber makes any display easier to read all day, every day. Used by **THE BOTTOM LINE**'s president, the USI Pi-3 Amber Monitor comes with his personal recommendation.

USI Pi-1 (9" Green)	$164.00
USI Pi-2 (12" Green)	$174.00

Amdek Monitors

AMDEK 300G (12")	$179.00
AMDEK Color I (12")	$379.00
AMDEK Color II (12") High Resolution RGB	$799.00
AMDEK Color III (RGB)	$499.00

Electrohome

1302-1 (12" RGB)	$429.00
1302-2 (12" Hi res RGB)	$799.00

IBM PC Upgrades

Quadram

QUADBOARDS

Memory in 64K blocks (up to 256K), a centronics-compatible parallel I/O with hardware to an external port, an asynchronous RS-232C communications port (DB-25 male external), and a clock/calendar with on-board battery—all of this on one QUADBOARD. Exceptional quality & design leaving remaining IBM PC slots free for other applications

64K QUADBOARD	$439.00
128K QUADBOARD	$539.00
192K QUADBOARD	$629.00
256K QUADBOARD	$719.00
64K MEMORY CHIPS (PKG. 9)	$99.00

QuCeS Inc.

Big Blue for the IBM PC features a Z80 microprocessor running at 5.5 MHz, 64K memory, a centronics-compatible parallel port, the RS-232C port, an on-board calendar/clock, & a hard disk interface.

BIG BLUE	$519.00

QuCeS Hard Disk subsystems for the IBM PC.

6mB HARD DISK	$2154.00
12mB HARD DISK	$2479.00
24mB HARD DISK	$3699.00

Xedex

BABY BLUE	$539.00

MicroSoft

64K RAMcard	$274.00
64K MEMORY CHIPS (PKG. 9)	$99.00

Maynard Electronics

FLOPPY DISK CONTROLLER	$189.00

Tandon Drives

40 TRACK, SS	$229.00
40 TRACK, DS	$319.00

IBM PC Software

We carry a full line of IBM PC Software. Ask about our Software Society discounts.

Orders & Information: CALL (603)-673-8857

Orders Only: CALL (800)-343-0726

No Hidden Charges

No surcharge for credit cards—No charge for UPS shipping—Stock shipments next day
All equipment shipped factory fresh with manufacturer's warranty—We accept CODs
Open PO's not accepted—$50 minimum order—No foreign orders accepted

Prices subject to change—call for quotes

VISA MasterCard

HIGH TECHNOLOGY AT AFFORDABLE PRICES

THE BOTTOM LINE

Milford NH 03055-0423

CIRCLE 127 ON READER SERVICE CARD

Listing 3. These Hexadecimal codes can be entered into memory from the system monitor. The CLEARSPLIT object code is shown.

```
*9400.9550

9400- A9 4C 8D F5 03 A9 14 8D
9408- F6 03 A9 94 8D F7 03 60
9410- 00 00 00 00 A9 BD 20 C0
9418- DE 20 67 DD 20 52 E7 A5
9420- 50 8D 10 94 A5 51 8D 11
9428- 94 A9 C1 20 C0 DE 20 67
9430- DD 20 52 E7 A5 50 8D 12
9438- 94 A5 51 8D 13 94 D8 A0
9440- 01 B1 67 D0 03 4C 12 D4
9448- 38 AD 10 94 E9 0B 8D 10
9450- 94 B0 03 CE 11 94 A5 67
9458- 85 50 85 5E A5 68 85 51
9460- 85 5F A0 01 B1 50 F0 DD
9468- CD 11 94 F0 11 B0 21 85
9470- 5F 88 B1 50 85 50 85 5E
9478- A5 5F 85 51 90 E4 85 9B
9480- 88 B1 50 CD 10 94 B0 08
9488- AA A5 9B 85 5F 8A 90 E4
9490- 38 A5 5E E9 01 85 9B A5
9498- 5F E9 00 85 9C 18 A5 AF
94A0- 69 01 85 96 90 02 E6 B0
94A8- 38 E5 9B 8D 10 94 A5 B0
94B0- 85 97 E5 9C 8D 11 94 18
94B8- AD 10 94 6D 12 94 85 94
94C0- 85 AF 85 69 AA AD 11 94
94C8- 6D 13 94 85 95 85 B0 85
94D0- 6A A8 8A 20 93 D3 A5 75
94D8- 48 A5 76 48 A0 03 B1 9B
94E0- 85 75 C8 B1 9B 85 76 20
94E8- 20 ED 68 85 76 68 85 75
94F0- A0 03 B1 9B 38 E9 01 91
94F8- 9B C8 B1 9B E9 00 91 9B
9500- A0 05 A9 AB 91 9B A2 FF
9508- E8 BD 00 01 C8 91 9B C9
9510- 00 D0 F5 18 A5 9B 69 01
9518- 85 9B 90 02 E6 9C 18 A9
9520- 01 6D 12 94 A0 00 91 9B
9528- 8D 12 94 48 90 03 EE 13
9530- 94 AD 13 94 C8 91 9B 85
9538- 9C 68 85 9B B1 9B F0 0E
9540- A0 04 C8 B1 9B C9 00 D0
9548- F9 C8 98 18 90 D3 4C 6C
9550- D6
```

Listing 2. Basic program that pokes the object code of CLEARSPLIT into the highest available RAM locations.

```
0  REM

'CLEARSPLIT' IS ASSEMBLED BY
THIS APPLESOFT PROGRAM

10  TEXT : HOME
20  PRINT "THE MACHINE CODE PROGRAM 'CLEARSPLIT'"
30  PRINT "IS NOW BEING ASSEMBLED UNDER HIMEM:"
40  REM

LOOK AT MACHINE'S HIMEM AND
CALCULATE STARTING LOCATION FOR 'CLEARSPLIT'
(I.E. $200 BELOW HIMEM)

50 P =  PEEK (116) - 2
60 HI =  PEEK (115) + 256 * P
70  FOR I = HI TO HI + 336
80  READ V: POKE I,V: NEXT
90  REM

NOW DATA HAS BEEN ASSEMBLED FOR
A 48K MACHINE.  IF YOURS IS
ALSO 48K, LINES 100 TO 140
INCLUSIVELY MAY BE DELETED

100  IF P = 148 THEN  GOTO 150
110  FOR I = HI TO HI + 336
120  IF  PEEK (I) < > 148 THEN  GOTO 140
130  POKE I,P
140  NEXT
150  PRINT : PRINT : PRINT : PRINT "INSERT YOUR DESTINATION DISC"
160  PRINT "AND PRESS RETURN TO SAVE IT"
170  GET T$: IF  ASC (T$) < > 13 THEN 170
180  PRINT  CHR$ (13) +  CHR$ (4)"BSAVE CLEARSPLIT,A"HI",L337"
190  REM

THE DATA FOLLOWS

200  DATA 169,76,141,245,3,169,20,141,246,3,169,148,141,247,3,96,0,0,0,0,169,189,32,192,222,32,103,2
21,32,82,231,165,80,141,16,148,165,81,141,17,148,169,193,32,192,222,32,103,221,32,82
210  DATA 231,165,80,141,18,148,165,81,141,19,148,216,160,1,177,103,208,3,76,18,212,56,173,16,148,23
3,11,141,16,148,176,3,206,17,148,165,103,133,80,133,94,165,104,133,81,133,95,160,1,177
220  DATA 80,240,221,205,17,148,240,17,176,33,133,95,136,177,80,133,80,133,94,165,95,133,81,144,228,
133,155,136,177,80,205,16,148,176,8,170,165,155,133,95,138,144,228,56,165,94,233,1,133,155
230  DATA 165,95,233,0,133,156,24,165,175,105,1,133,150,144,2,230,176,56,229,155,141,16,148,165,176,
133,151,229,156,141,17,148,24,173,16,148,109,18,148,133,148,133,175,133,105,170,173,17,148,109
240  DATA 19,148,133,149,133,176,133,106,168,138,32,147,211,165,117,72,165,118,72,160,3,177,155,133,
117,200,177,155,133,118,32,32,237,104,133,118,104,133,117,160,3,177,155,56,233,1,145,155,200,177
250  DATA 155,233,0,145,155,160,5,169,171,145,155,162,255,232,189,0,1,200,145,155,201,0,208,245,24,1
65,155,105,1,133,155,144,2,230,156,24,169,1,109,18,148,160,0,145,155,141,18,148,72,144
260  DATA 3,238,19,148,173,19,148,200,145,155,133,156,104,133,155,177,155,240,14,160,4,200,177,155,2
01,0,208,249,200,152,24,144,211,76,108,214
```

There are three ways around this last problem. In the first you must develop the program exclusively above the hi-res pages by changing the start of program pointers and using smaller arrays until you are convinced it is perfect. Then add the &CLEAR..TO.. line.

In the second you must keep on disk a version of the program which incorporates any changes you make but which is SAVEd before RUNning. It is this version which is edited. In the third you must use another program which will close up a split program. This is also listed and is called CLOSESPLIT. It is very simple to use. To edit a split program either BRUN CLOSESPLIT or if it is already in memory just CALL 768.

If after splitting a program you LIST it you will notice that CLEARSPLIT has introduced a line of Basic which is a GO TO. CLOSESPLIT will remove this, recombine the program, reset the end of program pointer, and do a CLEAR before returning you to Basic.

I have presented both programs both as Applesoft programs and as original source listings. Both of the Applesoft programs will assemble the appropriate machine code programs in RAM and will then save them to the required destination disk. CLOSESPLIT resides at $300, so the relevant Applesoft program will merely form it and SAVE it.

CLEARSPLIT, however, was originally assembled at $9400 for a 48K machine with DOS. So the relevant Applesoft program has been written so that it will determine the size of memory available (from the HIMEM: pointer at $73,74) for any machine and then assemble the program as appropriate.

Tape users can easily modify these two to their advantage and use CLEARSPLIT in the immediate mode. By incorporating the program within their own programs they can use it in the deferred mode. If you have difficulties with these programs I would very much like details of the problem so I can try to improve both of them. □

Get Omni quality for as little as $1.99... even if all you want is a 10 pack.

Call toll-free for great savings on Omni's complete line of 5¼″ and 8″ premium disks. Each is certified error-free at a minimum of twice the error threshold of your system. Each is rated for more than 12 million passes without disk-related errors or significant wear. And each is precision fabricated to exceed all ANSI specifications with such standard features as reinforced hub rings and Tyvec sleeves. Get same day shipment and an unconditional, no hassle money-back guarantee.

ARCHIVE

152 Boston Turnpike
Shrewsbury, MA 01545
(800) 343-0314; In Mass:
(617) 756-2960

Disk No.
OMNI
Copyright © 1981 by OMNI Resources
Description

Call toll free (800) 343-0314

In Mass: (617) 756-2960

Call if you're not sure which disk is compatible with your system. Call for prices on 96 tpi and special formats. We offer an unconditional money-back warranty. We're here to help.

Be sure to indicate system/drive name and model # at right.

	5¼″ disks		8″ disks		
	Cost per 10 pack	Quantity	Cost per 10 pack	Quantity	Total Cost
Single side/single density	$19.90	______	$24.90	______	$______
Single side/double density	$23.90	______	$31.90	______	$______
Double side/single density	---	______	$34.90	______	$______
Double side/double density	$37.50	______	$37.50	______	$______
Flip/Floppy reversible	$39.90	______	$39.90	______	$______
Plastic library case (in lieu of soft storage box)	$ 2.99	______	$ 3.49	______	$______
Shipping and handling ($2.00 first 10 pack, 40¢ additional 10 packs. Continental U.S. only.)					$______
5% sales tax (Mass only)					$______
Total					$______

☐ Check ☐ Master Card
☐ COD ☐ VISA

Card # ______________________ Exp. __________

System/drive model # ______________________

Name ______________________

Address ______________________

____

Tel. ______________________

CIRCLE 114 ON READER SERVICE CARD

```
         ORG  $300
CLS      EQU  $FC58
ERR      EQU  $D412
CLEAR    EQU  $D66C
DOS      EQU  $3D0
TO       EQU  $00
TEMP     EQU  $50
INDEX    EQU  $5E
PRGBEG   EQU  $67
ADDRS    EQU  $9B
PRGEND   EQU  $AF
********************
*
* CLOSESPLIT
*
********************
         JSR  CLS        ;HOME
         LDA  PRGBEG     ;ST INDEX TO POINT AT PROGRAM
         STA  INDEX
         LDA  PRGBEG+1
         STA  INDEX+1
         SEC
LOOP1    LDY  #$01       ;GET HI BYTE OF LINK ADDRESS
         LDA  (INDEX),Y
         BEQ  ERROR      ;ZERO BYTE IS END OF PROG
         STA  TEMP+1     ;TEMP STORAGE
         SBC  INDEX+1    ;WHAT'S THE DIFFERENCE
         CMP  #$01
         BEQ  CONT       ;IF 0 OR 1 THEN NOT YET SPLIT
         BCS  FOUND      ;IF >1 THEN FOUND SPLIT
CONT     DEY              ;LOOK AT LOW BYTE
         LDA  (INDEX),Y ;GET LO BYTE OF LINK
         STA  INDEX      ;& UPDATE INDEX
         LDA  TEMP+1     ;REGET HI BYTE
         STA  INDEX+1
         SEC              ;ALWAYS GO BACK & SET FOR SBC
         BCS  LOOP1      ;& GO BACK
ERROR    JMP  ERR
FOUND    LDA  INDEX      ;END OF THE FIRST HALF
         STA  TO
         LDA  INDEX+1
         STA  TO+1
         LDA  (INDEX),Y ;GET START OF 2ND HALF
         STA  ADDRS+1
         DEY
         LDA  (INDEX),Y
         STA  ADDRS
         SEC              ;CALC LENGTH OF PART TO MOVE
         LDA  PRGEND
         SBC  (INDEX),Y
         STA  TEMP       ;STORE LO BYTE
         LDA  PRGEND+1
         INY
         SBC  (INDEX),Y
         TAX              ;HI BYTE INTO X
         LDY  #$00
LOOP2    LDA  (ADDRS),Y ;MOVE TOP HALF
         STA  (INDEX),Y
         DEY
         BNE  LOOP2
         INC  INDEX+1    ;UPDATE POINTERS
         INC  ADDRS+1
         DEX
         BMI  LOOP4
         BNE  LOOP2      ;GO BACK FOR MORE
         LDY  TEMP
         BNE  LOOP2
LOOP4    INY             ;RESET IT TO 1
         LDA  (TO),Y     ;CHANGE LINK ADDRESSES
         BEQ  END        ;IF ZERO FOUND IT IS END OF PROG
         INY
         INY
LOOP3    INY             ;SKIP THE LINE NUMBERS
         LDA  (TO),Y     ;FIND END OF LINE TOKEN
         BNE  LOOP3
         INY
         CLC
         TYA
         ADC  TO         ;COMPUTE NEW LINK ADDRESS
         LDY  #$00
         STA  (TO),Y     ;AND UPDATE POINTER
         STA  TEMP       ;TEMP STORAGE
         LDA  TO+1
         ADC  #$00
         INY
         STA  (TO),Y
         STA  TO+1
         LDA  TEMP
         STA  TO
         SEC
         BCS  LOOP4
END      CLC
         LDA  TO         ;TO NOW POINTS TO END OF PROG
         ADC  #$03
         STA  PRGEND     ;SO UPDATE PRGEND
         LDA  TO+1
         ADC  #$00
         STA  PRGEND+1
         JSR  CLEAR      ;LET APPLESOFT DO THE REST
         JMP  DOS
```

Listing 4. Source code of CLOSESPLIT, the program that reunites the two sections of a split Basic program.

Listing 5. Basic program that installs CLOSESPLIT object code into RAM.

```
9  REM

DATA FOR THE MACHINE CODE PROGRAM 'CLOSESPLIT'

10  DATA 32,88,252,165,103,133,94,165,104,133,95,56,160,1,177,94,240,22,133,81,229,95,201,1,240,2,17
6,15,136,177,94,133,94,165,81,133,95,56,176,228,76,18,212,165,94,133,0,165,95,133,1
20  DATA 177,94,133,156,136,177,94,133,155,56,165,175,241,94,133,80,165,176,200,241,94,170,160,0,177
,155,145,94,136,208,249,230,95,230,156,202,48,6,208,240,164,80,208,236,200,177,0,240,34,200
30  DATA 200,200,177,0,208,251,200,24,152,101,0,160,0,145,0,133,80,165,1,105,0,200,145,0,133,1,165,8
0,133,0,56,176,217,24,165,0,105,3,133,175,165,1,105,0,133,176,32,108,214,76
39  REM

THE  PROGRAM BEGINS HERE
BY BEING POKED IN

40  DATA 208,3
50  TEXT : HOME
60  PRINT "THE MACHINE CODE PROGRAM 'CLOSESPLIT'"
70  PRINT "IS NOW BEING ASSEMBLED AT $300 (768)"
80  FOR I = 768 TO 768 + 152: READ J: POKE I,J: NEXT
90  VTAB 10: PRINT "INSERT YOUR DESTINATION DISC"
99  REM

NOW SAVE IT TO DISC

100  PRINT "WHEN READY PRESS <RETURN>"
110  GET T$: IF  ASC (T$) <  > 13 THEN 110
120  PRINT  CHR$ (13) +  CHR$ (4)"BSAVE CLOSESPLIT,A768,L153"
```

NEECO

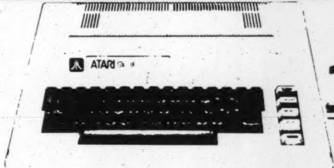
Commodore Computer

VIC 20 Personal Computer	$ 299.95
VIC 1515 Graphic Printer	$ 395.00
CBM 4016	$ 995.00
CBM 4032	$1295.00
CBM 8032	$1495.00
CBM SuperPet 9000	$1995.00
CBM 8050 Dual Disk Drive	$1795.00
CBM 4040 Dual Disk Drive	$1295.00
CBM 2031 Single Disk Drive	$ 695.00
CBM 4022 Tractor Printer	$ 795.00
CBM 8010 IEEE Modem	$ 279.00
CBM Datasette	$ 74.95
CBM-IEEE Interface Cable	$ 39.95
IEEE-IEEE Interface Cable	$ 49.95

Professional Software/for CBM Computers

WordPro™ — a Family of CBM Word Processing Programs

WordPro 2 Plus	$ 199.95
WordPro 3 Plus	$ 295.00
WordPro 4 Plus	$ 450.00
WordPro 5 Plus (for CBM 8096)	$ 450.00
The Administrator (DataBase for CBM)	$ 650.00
Power™ (Programmer's Utility ROM)	$ 89.95
InfoPro™ (DataBase for CBM)	$ 295.00



Atari

Atari 400 16K	$ 299.00
Atari 800 16K (incl. BASIC cartridge)	$ 899.00
Atari 410 Recorder	$ 99.95
Atari 810 Disk Drive	$ 599.95
Atari 822 Thermal Printer	$ 299.95

Amdek Monitors

Video 100G (Limited Quantity)	$ 119.00
Video 300G	$ 185.00
Color 1	$ 425.00
Color 2	$ 899.00

CMD Mupet

MC-800A Mupet Controller (Multi-User Controller for CBM Computers)	$ 995.00
CM-100 Channel Module	$ 250.00
Printer Module	$ 350.00

Qume

Sprint 9/45	$2495.00
Tractor Option	$ 210.00

Epson Printers

MX-70	$ 299.95
MX-80 w/ Graphtrax	$ 645.00
MX-80 FT	$ 745.00
MX-100 FT	$ 945.00
INTERFACE CARDS	
8141 RS-232 Interface Board	$ 75.00
8145 RS-232 Interface Board w/2K Buffer	$ 149.00
8151 RS-232 Interface Board w/X/ON-X/OFF	$ 170.00
8161 IEEE Interface Board	$ 55.00
8131 Apple Interface Card	$ 85.00
8232 Apple Interface Cable	$ 35.00
8220 TRS-80 Cable	$ 35.00

Diablo 630 Printer

Diablo 630	$2710.00
Tractor Option	$ 350.00

NEC Spinwriter Printer

NEC 7730	$3085.00
NEC 7710	$3085.00
NEC 7720	$3610.00
NEC 3510	$2290.00
NEC 3500RD	$1895.00

Tractor Feed Options are available

***WordPro, POWER, & InfoPro are registered trademarks of Professional Software Inc.**

CALL FOR OUR 70 PAGE CATALOG FOR COMPLETE PRODUCT LINE AND PRICE LISTINGS
WE WILL MATCH SOME ADVERTISED PRICES ON CERTAIN PRODUCTS LISTED UNDER SIMILAR "IN STOCK" CONDITIONS

NEECO
679 Highland Ave.
Needham, MA 02194

(617) 449-1760
TELEX: 951021

MON-FRI 9:00 - 5:30 E.S.T.
MASTERCARD VISA

CIRCLE 249 ON READER SERVICE CARD

Keeping Track of Variable Names in an Applesoft Program

Lawrence G. McMillan

When writing a large program in Applesoft, it often becomes difficult to keep track of the variable names used. This is true mostly because Applesoft only recognizes the first two characters of each variable name. While names of any length are allowable, only the first two characters determine uniqueness.

This means you can't, for example, use MAX0 and MAX1 for two variables representing the maxima of two sequences of numbers. You might therefore use M0 and M1, but then what do you use when you want to represent two minima for the same sequences? MIN0 and MIN1 are out, and you've already used M0 and M1, so you make up something else. After several hundred lines of code (especially if you don't own a printer), it can be confusing trying to remember what you have used and what you haven't.

Fortunately, the Applesoft Manual provides the addresses to the variable names in the variable table. The accompanying Applesoft utility routine accesses those locations and prints the variable names, also indicating whether the variable type is a real, integer, or string variable.

Simple Variables

Simple variables in Applesoft are stored consecutively, beginning at the address stored in locations 105 and 106 in memory. This is true for both ROM and cassette Applesoft. The actual location is determined as LOC = 256 * PEEK(106) + PEEK(105). This location also happens to be LOMEM for an Applesoft program.

Each simple variable takes up seven bytes of storage. The first two bytes are the character name, and the other five bytes represent the value of the variable. With only two bytes reserved for the variable name, you can see why Applesoft only recognizes the first two characters of a variable name when determining uniqueness.

> ***The variable type (floating point, integer, or string) is determined by the manner in which the two-character name is stored.***

The variable type (floating point, integer, or string) is determined by the manner in which the two-character name is stored. Most ASCII characters can be represented internally by the Apple in two ways—as a decimal number less than 128 or as a decimal number greater than 127. The "positive" representation is one that is less than 128 (the high-order bit is off). The "negative" representation is the one that is greater than 127 (the high-order bit is on). If the decimal representations of both characters in the variable name are "positive" (less than 128), then the variable is a real, or floating point, value. If both decimal representations are "negative" (greater than 127), then the variable is an integer. Otherwise, it is a string variable.

As an example, the integer variable name II% would be stored as 201,201 in the two bytes representing the character name. The % sign is not actually a part of the variable name, but is used by Applesoft as a special symbol to indicate that the value stored in the variable II is to be treated as an integer value. In this case, the character "I" is represented as 201—its negative representation. However, the character "I" may also be represented as decimal 73. This would be its positive representation. Hence, the real variable name, II, would be represented as 73,73. That is, both representations being positive indicate a real value.

Finally, II could also be a string variable (II$). If this were the case, then it would have a decimal representation of 73,201—the first representation is positive and the second is negative. Appendix K in the Applesoft Manual shows the various representations of each ASCII character, both positive and negative.

Since each simple variable takes exactly seven bytes of storage, it is a relatively easy matter to step through the variable table extracting the names and identifying the variable types. In the accompanying listing, the starting address of the variable table is obtained in line 10. Lines 40 to 80 do the work of identifying the variable type and then incrementing the address

---

Lawrence G. McMillan, 39 Meadowbrook Road, Randolph, NJ 07869.

by 7 to get to the next name. In this utility routine, only five names are printed at a time. To continue, the program must type "C" to continue the listing. The programmer will recognize the end of his simple variable table when strange characters or blanks begin appearing as variable names. Once this happens, he may then type an "A" to begin scanning the array variables. Lines 120 to 140 in the listing handle these things.

Array Variables

The pointer to the beginning of the array variables is stored by Applesoft in locations 107 and 108. Again, the address where these variables begin is determined as LOC = 256 * PEEK(108) + PEEK(107). The routine determines this at line 150 and sets a flag at line 160. This flag indicates to the utility that array variables, not simple variables, are now being scanned.

As was the case with simple variables, the first two bytes of storage of an array variable are the decimal representations of characters in the variable name. The same recognition rules apply—a real has two positive representations, an integer has two negatives, and a string has one of each. However, the way in which the actual values of the array variable are stored differs somewhat from the way in which the simple variable value was stored. Each simple variable used five additional bytes of storage to represent its value. However, since arrays may be of varying length, the amount of storage used is not fixed. Rather, the third and fourth bytes of storage for the variable are used to denote how many bytes of storage are necessary for the storage of this entire array.

Listing 1.

```
 10 X = 265 * PEEK (106) + PEEK (105):REM GET SIMPLE VARIABLES
                                         STARTING POINT
 20 PRINT X; "=STARTING ADDR FOR SIMPLE VRBLS"
 30 L = 0:            REM FLAG DENOTING SIMPLE OR ARRAY VRBLS
 40 FOR I = 1 TO 5
 50 PRINT CHR$ (PEEK (X)); CHR$ (PEEK (X + 1));
 60 IF PEEK (X) > 127 AND PEEK (X+1) > 127 THEN PRINT "%";
 70 IF PEEK (X) < 128 AND PEEK (X+1) > 127 THEN PRINT "$";
 80 IF L = 0 THEN X = X + 7 : REM ADD 7 FOR SIMPLE VRBLS
 90 IF L = 1 THEN X = X + PEEK (X + 2) + 256 * PEEK (X + 3)
100 PRINT
110 NEXT I
120 INPUT "C TO CONTINUE, A FOR ARRAYS"; LTR$
130 IF LTR$ = "C" THEN 40
140 IF LTR$ <> "A" THEN 120
150 X = 256 * PEEK(108) + PEEK (107): REM GET START OF ARRAY LIST
160 L = 1 : REM SET FLAG FOR ARRAY VRBLS NOW
170 GO TO 40
```

One can then determine the address at which the next array begins by adding this length to the beginning address of the array variable at which you are currently looking. That is,

start of next array variable = 256*PEEK (4th byte) + PEEK(3rd byte) + starting address of this array.

This is done in line 90 of the accompanying listing.

The routine has no end statement, so the user can hit CTRL C to terminate when he has reached the end of his array table.

Running the Routine

To run this routine, first store it separately on disk. Then use RENUMBER and its MERGE facility to place the routine just before the END statement in your program. Then, at the end of the next execution of your programs, you will get a list of your variable names. For those not familiar with RENUMBER:

1) RUN RENUMBER

2) LOAD or type in this routine and renumber its line numbers to be just before the END statements of your main program's END statement

3) &H to put the routine in the HOLD area

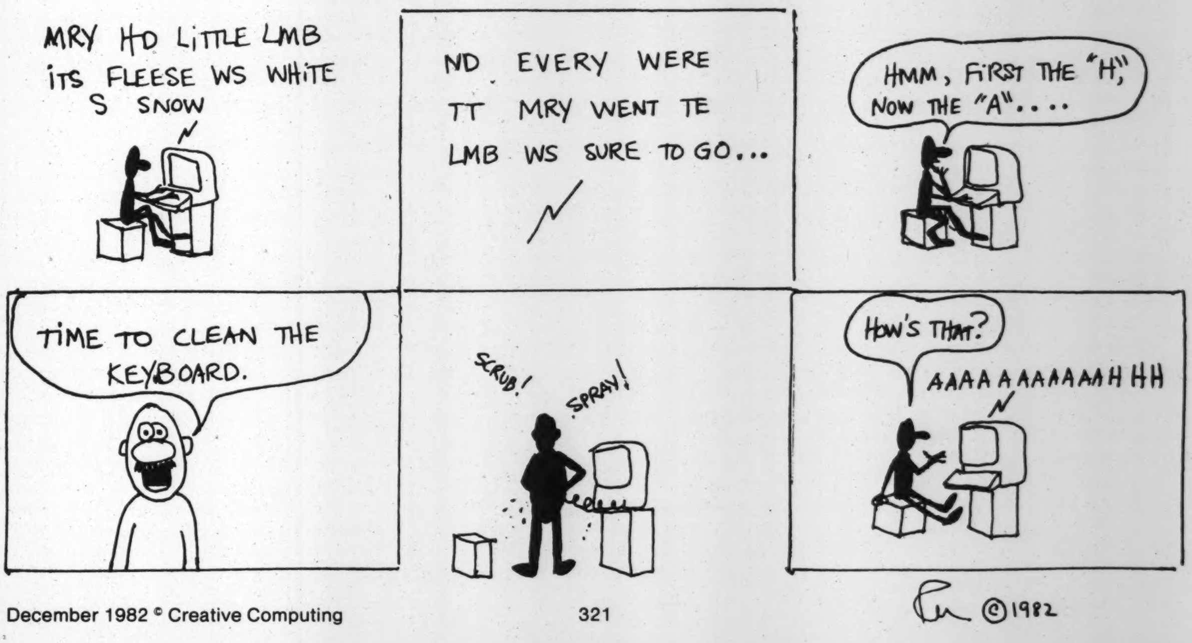
4) LOAD your main program

5) &M to merge the two (program and routine) together

6) RUN the main program

Summary

To summarize, writers of lengthy Applesoft programs may lose track of their variable names because of the two-character representation. The accompanying routine steps through the simple and array variable tables, identifying the variable type. It is a handy way of keeping track of the variable names before some serious and time-consuming bug crops up because a variable name was inadvertently re-used. ☐



Output Au Naturel

Daniel H. Lowenstein

"What is this," you say, "a Fortran article in Creative Computing?*" Yes. For two reasons.*

First, many readers have systems with Fortran and to use material in Creative *they generally must convert from Basic. They occasionally grumble, but usually not. They generally are a resourceful lot. Well this is for them. No conversion necessary.*

Second, this is a useful technique and readers with Basic speaking systems should have little trouble understanding the well-commented listing.—DHA

If you have been writing programs which involve word processing, you have undoubtedly run across the problem of formatting your output so that it reads naturally. That is, text is constructed so that words are properly spaced, punctuation is correct, and the text has normal sentence and paragraph structure.

In my work involving computer-aided medical diagnosis, I have faced this problem as well. We who are familiar with the ins and outs of computers do not find the typical tabular output of our machines offensive. However, physicians and other health-care personnel expect a report to read as though it were written with standard rules of text formatting.

Not having a sophisticated text editor onboard my mini to handle this task, I developed a technique that interprets a diagnostic algorithm and outputs a paragraph summary which reads as though a physician wrote it.

The approach I use is so straightforward, flexible, and reasonable in storage requirements, that some of you in the micro world might be interested in trying it out.

The only prerequisites are a machine which has enough memory to handle the library of phrases from which you construct the output (plus some memory for the algorithm to fit them together), and a language which can concatenate and split strings (e.g. Fortran 77).

I will use the game "Adventure Caverns" in my examples cited below. This game challenges the player to find his way to a treasure by specifying the directions and implements needed for travel through a mythical land. After each user response, the computer summarizes the travel thus far and prompts for more decisions.

The fancier versions of this game format the output in paragraphs and become interactive fairy tales. The basic approach I describe, however, can be applied to any task which involves formulating text based upon an algorithm and formatting it naturally, e.g. business reports, weather summaries, and astrology impressions.

The strategy is outlined in Figure 1. The data resource would include the information specifying the parameters of the game as well as the prior responses of the user. The algorithm specifies the rules and keeps track of the advancement of the player.

The *phrase array* is a lexicon of all the possible phrases which might be used in the status reports of a game. Each separate phrase constitutes a single element of the array. The array is defined as type *character*.

I chose a string length of 30 in my applications, though this could be modified to a more convenient length depending upon your own needs. The ordering of phrases within the phrase array may be arbitrary, though I found that grouping them according to common usage facilitated code formulation and changes.

Now, using the algorithm, a second array is defined. Contained within this *report array* are the element locations of the phrases to be used in a particular report. As an example, let us suppose that the player is asked in what direction to proceed. The response is "north."

The algorithm, which is keeping track of the player's location, specifies that this would head the player into the Misty Mountains. Therefore, an element in the report array might be assigned the integer value 31, corresponding to the thirty-first element in the phrase array: "You are now heading." The next element of the report array would be filled with the integer value 10, corresponding to the phrase 'north."

As the figure shows, the subsequent elements in the report array would be filled with the phrases which comprise the desired sentence. Once fully constructed, the report array becomes a source for defining the sequence of phrases to be used in a particular output.

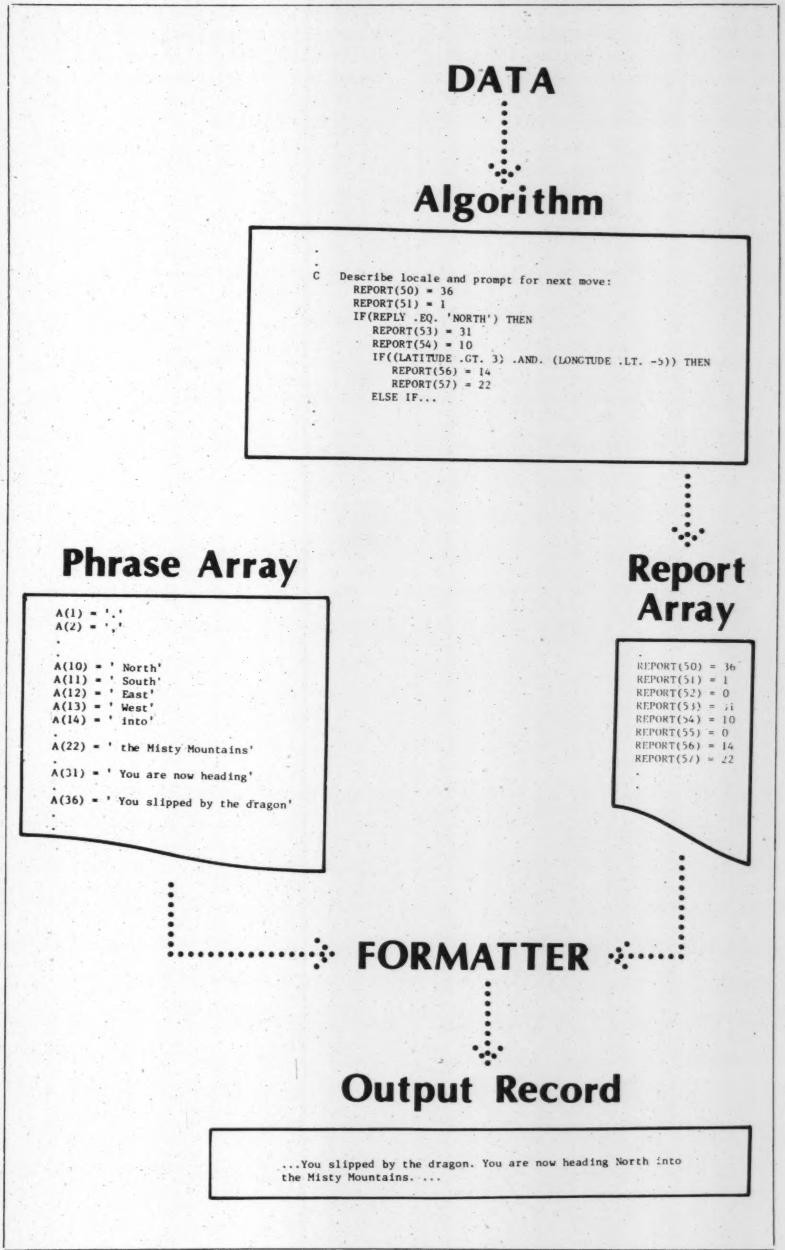
Next, a *formatter* subroutine is called.

The Fortran 77 code is found in Listing 1. By accessing the information within both the report array and phrase array, the program concatenates individual phrases into lines of text. Line length are defined according to the desired format of the output record.

In the event a phrase exceeds the extent of the line, the formatter searches for blanks within the phrase, places a shorter part of the phrase in the line if possible, and places the remainder of the string in the following line of text. If the formatter encounters a null value in an element of the report array, it merely ignores that element. Therefore, it is not necessary to have every element of the report array filled with a value. I have found this to be

---

Daniel H. Lowenstein, 65 Pleasant St. #3, Brookline, MA 02146.



```
.
.
C   Describe locale and prompt for next move:
      REPORT(50) = 36
      REPORT(51) = 1
      IF(REPLY .EQ. 'NORTH') THEN
         REPORT(53) = 31
         REPORT(54) = 10
         IF((LATITUDE .GT. 3) .AND. (LONGTUDE .LT. -5)) THEN
            REPORT(56) = 14
            REPORT(57) = 22
         ELSE IF...
.
.
```

```
A(1) = '.'
A(2) = ','
.
.
A(10) = ' North'
A(11) = ' South'
A(12) = ' East'
A(13) = ' West'
A(14) = ' into'
.
A(22) = ' the Misty Mountains'
.
A(31) = ' You are now heading'
.
A(36) = ' You slipped by the dragon'
.
.
```

```
.
REPORT(50) = 36
REPORT(51) = 1
REPORT(52) = 0
REPORT(53) = 31
REPORT(54) = 10
REPORT(55) = 0
REPORT(56) = 14
REPORT(57) = 22
.
.
```

```
...You slipped by the dragon. You are now heading North into
the Misty Mountains. ...
```

Figure 1.

a great aid in altering text.

By the time the formatter subroutine passes back to the main program, the phrases have been arranged into lines and can be written to the desired output device. The sample sentence constructed above might be at the end of a status report reading as follows:

...You slipped by the dragon. You are now heading north into the Misty Mountains. There is a clearing ahead. In what direction do you wish to proceed?

You might note that the subroutine checks for punctuation marks to ensure that they do not become the first character in a new line. Also, in order to create a new paragraph, the algorithm merely has to place the integer which specifies a string of five blanks into the report array.

If you use a Word Processor, you need

GRAMMATIK

Beyond Spelling Checking

Grammatik can find **over 15 different** kinds of common errors missed by simple spelling checkers alone, including punctuation and capitalization errors, overworked and wordy phrases, and many others. Use Grammatik with Aspen Software's spelling checker Proofreader, featuring the Random House Dictionary®, or with your current spelling checker for a complete document proofreading system.

Read what the experts say:

"The perfect complement to a spelling checker."
Alan Miller, Interface Age, 5/82

"A surprisingly fast and easy tool for analyzing writing style and punctuation."
Bob Louden, InfoWorld, 12/81

"Anyone involved with word processing in any way is encouraged to get this excellent program."
A.A. Wicks, Computronics, 6/82

"A dynamic tool for comprehensive editing beyond spelling corrections."
Dona Z. Meilach, Interface Age, 5/82

"A worthy and useful addition to your word processing software."
Stephen Kimmel, Creative Computing, 6/82

Works with CP/M®, IBM-PC®, TRS-80®

Grammatik $75.00
Proofreader $50.00

Order directly from Aspen Software, or see your local dealer. Specify your computer system configuration when ordering! Visa, Mastercard accepted.

Random House is a registered trademark of Random House, Inc. Other registered trademarks: CP/M: Digital Research -- TRS-80: Tandy Corp. -- IBM: IBM -- Proofreader, Grammatik: Aspen Software Co.

Aspen Software Co.
P.O. Box 339-C Tijeras, NM 87059
(505) 281-1634

THERE IS ONLY ONE MAGAZINE FOR THE ELECTRONIC MUSICIAN*

Introducing

ROLAND USERS GROUP

Featuring

The incredible success story of the BOSS Products Group; Who's using the new Roland Jupiter-8 and Guitar System and how it's influencing their music; A conversation with Jeff Baxter; The advantages of interfacing; The Roland Synthesizer Tape Contest; Song of the Month Club; Innovative new products, hot off the Roland production line... and more!

*THAT YOU CAN GET FREE JUST BY REQUESTING IT!

Get the new **ROLAND** USERS GROUP absolutely free by filling out the form below, and sending it to RolandCorp US, 2401 Saybrook Ave., Los Angeles, CA 90045.

Name

Street

City

State

Zip CC

CIRCLE 301 ON READER SERVICE CARD

Output, continued...

As you can see, the applications of this approach for natural language formatting are limited primarily by the memory allocation on your machine. A valuable subroutine which could improve the efficiency of the code would be one which packs the phrases in the phrase array. In this way, the default length of 30 for the array would not be placing unneeded blanks into memory. In addition, I have yet to explore the possibility of splitting words into syllables. ☐

Listing 1.

```
        SUBROUTINE MINIFORM(A,B,LINE)

C*****************************************************************
C
C                Created by D. H. Lowenstein
C
C     The lexicon of phrases is passed to this subroutine and
C   defined as the array "A." Also passed is the report array, which
C   specifies the make-up of the text, defined as array "B." The
C   formatted text will be passed back to the main program in the
C   array "LINE."
C
C*****************************************************************
        CHARACTER*78 LINE(12), A(100)*30
        INTEGER B(100),LINELEN,NPHRASE,WORDSLEN,LINEUSED
C
C      Definitions of Local Variables:
C          LINELEN = Length of line of text. (Must equal that
C                    specified in the above CHARACTER statement!!)
C          NPHRASES = Number of phrases being used (Highest non-blank
C                    element of A)
C          WORDSLEN = Length of phrase
C          PHRASLEN = Maximum length of phrases (dimension of A!!)
C          LINEUSED = Portion of line filled
C
C     Initialize variables:
C
        LINELEN=78
        NPHRASES=100
        PHRASLEN=30
        LINEUSED=0
        K=1
C
C
        DO 1000 I=1,NPHRASES
C
C     If an element of the report array is null, loop through to
C     the next element.
C
           IF(B(I) .EQ. 0) GO TO 1000
C
C     Otherwise, determine the length of trailing blanks and hence the
C     "true" length of the phrase:
C
           DO 100 J=PHRASLEN,1,-1
              IF( A(B(I))(J:J) .NE. ' ') THEN
                 WORDSLEN = J
                 GO TO 200
              END IF
100        CONTINUE
C
C     If there is space in the present line to place the phrase,
C     do so.  The last character space in each line is
C     reserved for placement of punctuation (i.e. to avoid placing
C     a period or comma at the beginning of a line.)
C
200        IF( (LINELEN - LINEUSED) .GT. WORDSLEN) THEN
              LINE(K) = LINE(K)(1:LINEUSED)//A(B(I))
              LINEUSED = LINEUSED + WORDSLEN
              GO TO 1000
           ELSE
C
C     If the full phrase does not fit, check to see whether a
C     shorter part can be placed in the present line and the
C     remainder into the following line:
C
           DO 300 N=WORDSLEN,1,-1
              IF(A(B(I))(N:N) .EQ. ' ' .AND. (LINELEN - LINEUSED)
     1        .GT. N) THEN
                 LINE(K) = LINE(K)(1:LINEUSED)//A(B(I))(1:N)
                 LINE(K+1) = A(B(I))(N+1:WORDSLEN)
                 K=K+1
                 LINEUSED=WORDSLEN - N
                 GO TO 1000
```

Listing 1, continued...

```
              END IF
300        CONTINUE
           END IF
C     If the phrase to be inserted is a punctuation character
C     and there is only one space remaining in the line, insert the
C     character.  The code assumes that all punctuation
C     marks are listed within the first five elements of the
C     phrase array.
C
           IF((LINELEN - LINEUSED .EQ. WORDSLEN) .AND. (B(I) .LE.
     1     5)) THEN
              LINE(K) = LINE(K)(1:LINEUSED)//A(B(I))
           ELSE
C
C     Otherwise, place the phrase into the following line:
C
              LINE(K+1) = A(B(I))
              LINEUSED = WORDSLEN
              K=K+1
           END IF
1000    CONTINUE
C
C
C     For appropriate spacing of words, phrases (other than
C     punctuation) in the phrase array have a leading blank.
C     In order to rid text lines of first position blanks, the
C     following is carried out prior to RETURN...
C
        DO 2000 K=1,12
           IF(LINE(K)(1:1) .EQ. ' ') LINE(K) = LINE(K)(2:78)//' '
2000    CONTINUE
        RETURN
        END
C
C****************************************************************
```

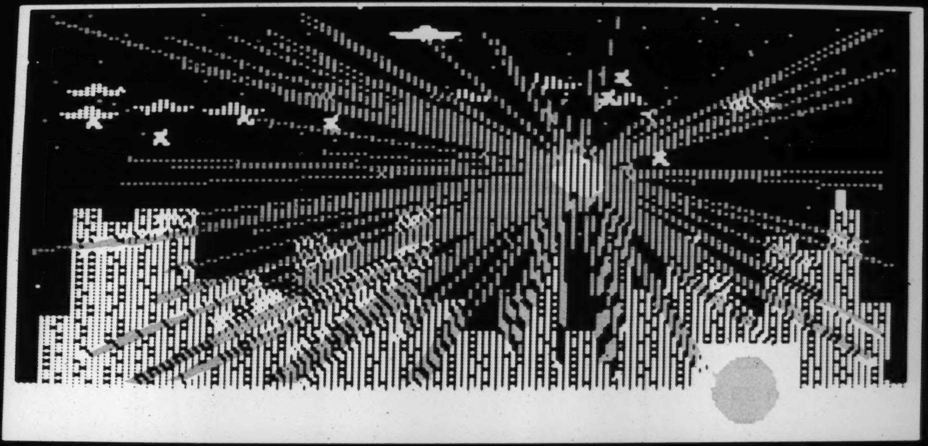
SOFTWARE GALORE
Best Prices Anyway.
Member, Better Business Bureau

IBM	LIST	SALE
Home Accountant Plus	150.00	120.00
Write On	129.95	103.96
Zork II	39.95	31.96
T.I.M. III	495.00	396.00
Easywriter II	350.00	280.00
Wordstar	495.00	396.00
IBM Joysticks	64.95	51.96
Visicalc 256K	250.00	199.00
HARDWARE		
Rana Disk Drives	449.00	359.20
Micro Modem II	379.00	285.00
Nec Printer 3510	2,290.00	1,832.00
Apple Cat II	389.00	330.65
Super Fan II	79.95	65.56
Vision 80 Column Card	395.00	316.00
Nec Green Screen	285.00	185.00
Amdek Color	695.00	560.00
Espon MX80FT	745.00	595.00
Espon MX100	995.00	865.00
APPLE		
Microsoft Prem. Sys.	775.00	520.00
Visicalc 3.3	250.00	185.00
Videoterm 80 col.	345.00	270.00
Systems Plus (ALL MODS)	1,395.00	995.00
D.B. Master	229.00	183.00
Wordstar	375.00	275.00
Microsoft Softcard	395.00	270.00
d Base II	700.00	499.00
Screenwriter II	129.95	103.00
Supertext 40/80	150.00	120.00
Visitrend/Plot	300.00	225.00
Bandits	34.95	27.96

VISA ORDERS 800-423-6326 master charge
Calif./memberships 213-827-1851
We are a membership buying service.
Member, Better Business Bureau
(School P.O. welcomed)
P.O. Box 10005 • Marina del Rey, CA 90291

CIRCLE 323 ON READER SERVICE CARD

a city dies whenever night falls



As Commander of
the Emerald Cityscape,
How many nights
can you survive?

Are you really good enough for this one? Can you make it through to just one more dawn? Nine levels of play from beginner to impossible. For the Apple II or II+, 48K with paddles or joystick.

See NIGHTFALLS at your dealer or order direct for $29.95. Mastercard and Visa holders order toll-free, 1-800-835-2246.

CIRCLE 254 ON READER SERVICE CARD

OMEGA MICROWARE, INC.™
222 So. Riverside Plaza
Chicago, IL 60606
312-648-4844

Apple II and Apple II+ are registered trademarks of Apple Computer, Inc. NIGHTFALLS is a trademark of Omega MicroWare, Inc.

A Scrolling Routine For CBM/PET Output Listings

Alfred J. Bruey

What do you do if you write a program with 100 lines of output and you don't have a printer? There are three things you can do:

1. Take a speedreading course so you can read the text as it scrolls past on the screen.

2. Run the program. When what you want to see appears on the screen, press STOP. Then type CONT when you are ready to continue with the listing.

3. Put a routine in your Basic program so that it will print the first, say, 20 lines and then stop with the message PRESS RETURN TO CONTINUE. When you are done examining the first 20 lines, you press RETURN and the next 20 lines are displayed on the screen.

All three of these methods have a major shortcoming: once the output has gone off the screen, you can't recall it unless you run the program again. The third method also has a disadvantage in that there is no way to see, for example, lines 10 to 25 on the screen at the same time—lines 1 to 20 fill the screen, then lines 21 to 40, etc.

The program described here provides a simple Basic output scrolling routine. With this routine added to your program, you can scroll up or down either one line or one page (20 lines) at a time, or you can scroll to the top or bottom of the listing. Each of these actions requires only one keystroke.

There is one limitation: All data to be output to the screen must be loaded into an array. After the output has been collected in this array, you branch to a subroutine which handles all the scrolling functions mentioned above.

The print routine given here is an example of the use of the scrolling routine. You can customize it to suit your own purposes. I shall try to explain the coding well enough so that you can extract the parts that you need.

The print subroutine works as follows:

1. We'll assume in this example that the data which we will output will be in array P(I). This array will be dimensioned 100. Any array can be used, and it may be two-dimensional. The first part of the coding is a routine to load data into P(I). So that this example will be easy to follow, I have set P(I)=I.

2. The first thing I do in the print subroutine is to list the first 20 items in P(I). Then the scrolling routine will be activated.

3. The scrolling routine will react to the following keys (note that it will not be necessary to press RETURN since the GET key is used for the scrolling commands).

U	Scroll up 20 lines
D	Scroll down 20 lines
/	Scroll up one line
*	Scroll down one line
L	List last 20 lines in file
F	List first 20 lines in file
R	Return to main program

Enter the program shown in Listing 1. When you RUN it, it will generate the array P(I) and list the first 20 items, the integers from 1 to 20, on the screen. Press the keys as described in the preceding list and notice how you can scroll back and forth through the list as many times as you wish. Press R when you are done and the program will stop.

To adapt this to your own program, make sure that the dimension in line 1060 is at least as big as your output file. Then set MX in line 5030 to the exact length of your output file. The array that you want to print out goes in line 5070.

This routine should make it easier for you to examine long output listings when you don't have a printer to which to dump them. □

Alfred J. Bruey, 201 S. Grinnell St., Jackson, MI 49203.

Listing 1.

```
100 REM ***********************
110 REM * PSEUDO-SCROLLING EXAMPLE
120 REM * BY ALFRED J. BRUEY       *
130 REM ***************************
140 REM * SET FOR NO. LINES OUTPUT *
150 REM ***************************
160 DIM P(100)
170 REM * INITIALIZE ARRAY TO SCROLL
180 FOR I=1 TO 100
190 P(I)=I
200 NEXT I
210 REM * GO TO SCROLL ROUTINE
220 GOSUB 5000
230 PRINT" END OF PROGRAM"
240 STOP
250 END
5000 REM *****************
5010 REM PRINT SUBROUTINE *
5020 REM *****************
5030 MX=100  : REM NO. OF LAST LINE
5040 F=1:L=20
5050 PRINT"□"
5060 FOR I=F TO L
5070 PRINT P(I)
5080 NEXT I
5090 PRINT:PRINT"▣TO SCROLL PRESS U,D,/,*,F,L,R■"
5100 GET S$:IF S$="" THEN 5100
5110 IF S$="U" THEN F=F-20:L=L-20:GOTO6000
5120 IF S$="D" THEN F=F+20:L=L+20:GOTO6100
5130 IF S$="/" THEN F=F-1:L=L-1:GOTO6000
5140 IF S$="*" THEN F=F+1:L=L+1:GOTO6100
5150 IF S$="F" THEN F=1:L=20:GOTO5050
5160 IF S$="L" THEN L=MX:F=MX-19:GOTO5050
5170 IF S$="R" THEN RETURN
5180 GOTO5100
6000 IF F<=0 THEN F=1:L=20:GOTO5050
6050 GOTO 5050
6100 IF L>MX THEN L=MX:F=MX-19:GOTO5050
6150 GOTO5050
READY.
```

IBM PERSONAL COMPUTER USERS

COMPLETE YOUR REFERENCE LIBRARY

Que On Systems
IBM's PERSONAL COMPUTER
que

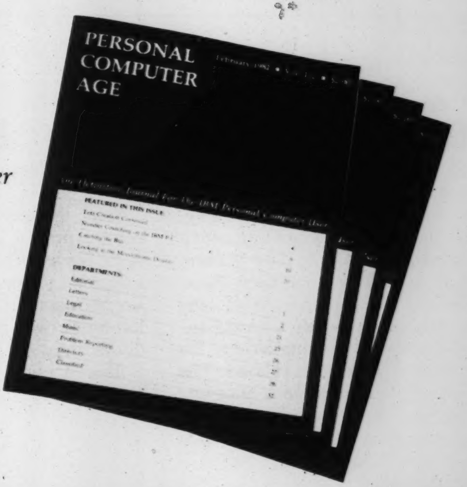
Que On Systems

IBM's PERSONAL COMPUTER

Que Corporation's new 300 page book, IBM's PERSONAL COMPUTER describes the hardware, peripherals and IBM's program library. Whether you are an IBM Personal Computer user or prospective buyer, you will discover the significance of IBM's new product to your personal or business applications.

...at computer stores and fine book stores $14.95

and...



PERSONAL COMPUTER AGE

The Definitive Journal For The IBM Personal Computer User

Keeps you updated monthly with the latest news and applications for your IBM Personal Computer. Featuring: Hardware and Software Reviews — New Product Announcements — Technical Articles — Problem Reporting — Vendor Directory — Classified Ads — Special Interest Columns.

$18.00/YR.
(12 issues)

BOTH FOR ONLY $22.95

PERSONAL
COMPUTER
AGE

For Credit Card Orders, Dial Toll Free
(800) 227-2634 ext. 936
In California
(800) 772-2666 ext.936

☐ I Want Everything — PERSONAL COMPUTER AGE and IBM's PERSONAL COMPUTER for $22.95

☐ NEW ☐ RENEWAL

☐ Send the Book only for $14.95

☐ Just enter my subscription to PERSONAL COMPUTER AGE for $18.00

☐ Payment Enclosed

Charge my: ☐ VISA ☐ MASTER CHARGE

Card # ____________________

Expiration Date: ____________________

____
Authorized Signature

____
Name

____
Address

____
City

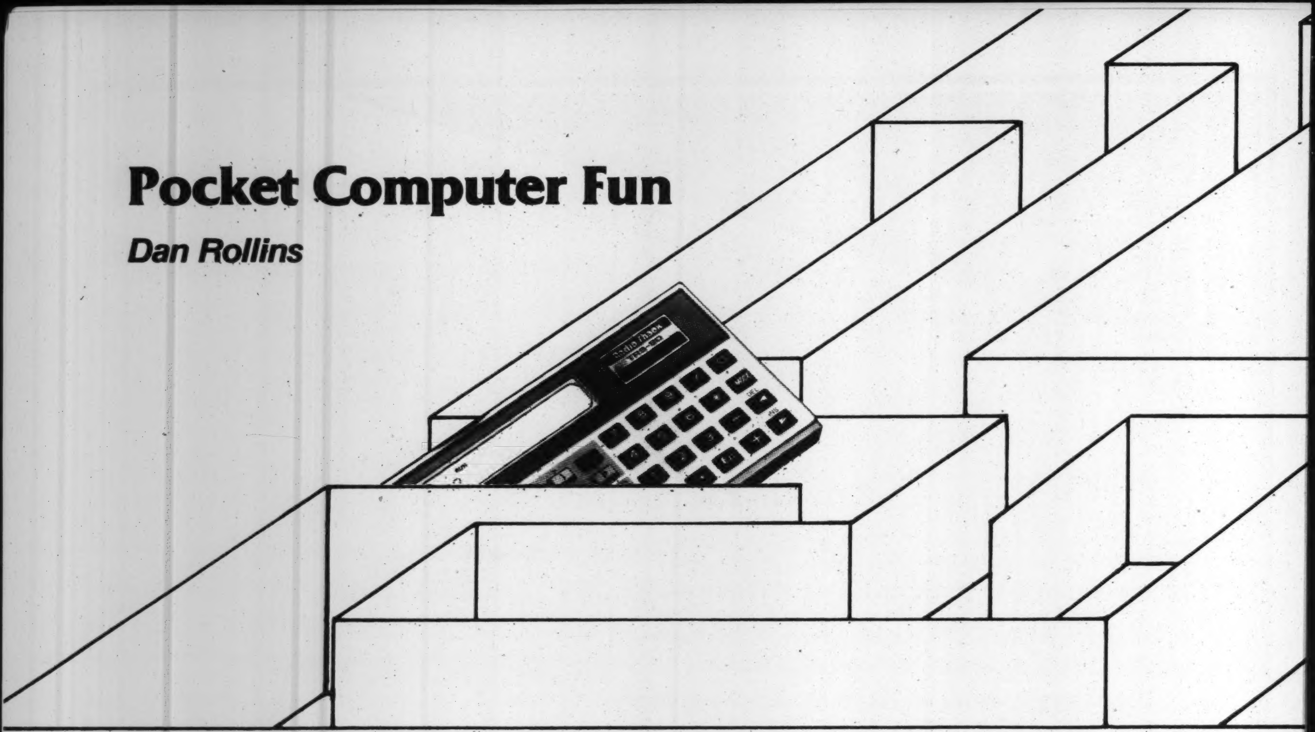
____
State Zip

PERSONAL COMPUTER AGE P.O. BOX 70725 Pasadena, California 91107 Dept.HC

CIRCLE 270 ON READER SERVICE CARD

Pocket Computer Fun

Dan Rollins



The Radio Shack Pocket Computer is not much larger than a check book, but it packs the power of a machine which, 20 years ago, would have filled a room and required scores of technicians to operate.

Though it lacks some of the qualities which I suspect will be seen in the next generation of small computers—notably tele-communications (easy hookup with a larger computer), multiple line screen, full musical capability, and such Basic commands as PEEK, POKE, USR, and INKEY$—it is, nevertheless, a good buy.

Most of the software being written for this little beauty is business related. The Radio Shack Games package is not quite what I was looking for, so I wrote the following program to give my pocket companion something to do when it is away from the office.

Pocket Maze

Pocket Maze prints a randomly created maze on your pocket computer printer. The algorithm guarantees only one direct path from entrance to exit.

The program adjusts an X,Y pointer through a two-dimensional array, adding "door" values to initially zero cells. Each configuration of doors (combination of UP, DOWN, LEFT, and RIGHT) must have a unique value for decoding in the print routine. By assigning to the various directions values which are powers of 2 as follows,

UP =1
RIGHT =2
LEFT =4
DOWN =8

any combinations will be unique and easily converted. This also means that the highest value a cell will ever attain is 15.

Since the maze can be only seven cells across (printer limitations) and memory is still "expensive" in the Pocket Computer, I decided to pack one line of cells into a single "memory." A cell on the farthest left border will give its line the value of its doors times 1.

The second column of cells is saved as DOORS * 16, the third as DOORS * 256. Thus, the value of the cell is the Xth nibble within the maze array element defined by the Yth ordinate.

The subroutine in line 3 returns the value of this nibble in the variable W. Using this routine cuts memory usage by a factor of 7, but increases program execution time.

The example maze (7 by 10) took 22 minutes to generate and print. The program flashes the number of cells left to keep you informed as to its progress. But, while scanning for a new opening after getting stuck, it will take a long time to make a move. This usually happens toward the end, so patience is a plus.

Table 1. Pocket Maze Variables Table.

A$-G$ = A$(1 to 7)	Printer output line
H-N = A(8 to 14)	Powers of 16 table (I = 16)
O	Not used (looks like 0)
P	Temp value = 31 + Y
Q	Height of maze
R	Count of unused cells
S	Count of valid directions (1 to 4)
T	Temp X for subroutine 3
U	Temp Y for subroutine 3
V	Not used
W	Return value from subroutine 3 a nibble from 0 to 15
X	Current horizontal maze ordinate
Y	Current vertical maze ordinate
Z	Random number (fraction)
A$(27 to 30)	List of valid directions
A(31 to MEM)	Maze array, each element holds values of 7 cells

---

Dan Rollins, 370 N. Cerritos, Apt. 15-A, Azusa, CA 91702.

Description of the Program

Line 1: Begin execution via RUN or Shift-M (DEF mode).

Line 2: Subroutine returns pseudorandom number less than 1.

Line 3: Subroutine returns a 4-bit value for a multiple of a power of 16—value of a maze cell.

Lines 4-7: Routines update cell values and X,Y pointer.

Line 10: Get a random number seed and print it. A given seed will generate the same maze for a given height.

Line 20: Get maze height and adjust for 0th array element.

Line 30: Clear maze array.

Line 40: Create look-up table for powers of 16. This avoids "accuracy errors" associated with exponentiation and increases the speed of the program.

Line 50: Give top left cell a door on top (entrance to maze), initialize X and Y to 0, determine total number of cells.

Line 60: This is the top of the MAIN loop. Decrements cell counter, flashes assurance, and checks for done.

Line 70: Initialize valid direction counter and temporary Y.

Lines 80-120: Determine valid directions, placing them in list.

Line 130: If at least 1 valid direction, choose randomly.

Line 140: —Else scan across and down.

Line 150: Check new cell. If it has a door, check to see if it adjoins a doorless cell by running through main loop (sans counter decrement).

Line 160: —Else scan further.

Line 300: DRAW maze. A maze may be redrawn with Shift-D. Send a line feed and set up loop counters.

Lines 310-320: Check for door UP and save correct value for output.

Line 320: Print top of each cell.

Lines 330-360: Determine and print side walls of each cell.

Line 380: Print bottom line. Exit may be placed anywhere.

This may seem like a large program to create a tiny maze, but a much longer maze (7 by 50 or so) is possible. But it would take a long time to produce.

Notice that the print routine builds an output line by moving string values into A$(1) to A$(7). These are later printed via PRINT A$;B$;C$;D$;E$;F$;G$. A$(1) is a redefinition of A$, as A$(2) is a redefinition of B$, etc. It is not possible to leave a trailing semicolon (;) after printing a value. So line 320 can't simply:

```
PRINT "+";
```

as in Level II Basic. It is also illegal to:

```
PRINT A$(X); A$(X+1);
A$(X+2); etc.
```

Each output string must be either a letter variable name (i.e. C$) or an array variable subscripted by an integer value such as A$(3). □

Example Maze.

```
RND SEED=98765.
HEIGHT  = 10.

+ +-+-+-+-+-+-+
I       I   I I
+-+-+ + + + + +
I     I I I   I
+ + +-+ + +-+-+
I I I   I     I
+ + +-+-+-+-+ +
I I   I   I I I
+ +-+ + + + + +
I I I I I     I
+ + + + +-+ +-+
I I   I   I   I
+-+ +-+-+ +-+ +
I   I     I I I
+ +-+ +-+-+ + +
I   I I     I I
+-+ + + +-+-+ +
I I     I   I I
+ +-+-+-+ + + +
I         I   I
+-+-+-+-+-+-+ +
```

Listing 1.

```
  1:"M"GOTO 10
  2:Z=9821Z+.211
    327:Z=Z-INT
    Z:RETURN
  3:W=INT (A(31+
    U)/A(8+T)):W
    =W-INT (W/I)
    *I:RETURN
  4:"LEFT"A(P)=A
    (P)+4A(8+X):
    X=X-1:A(P)=A
    (P)+2A(8+X):
    GOTO 60
  5:"RIGHT"A(P)=
    A(P)+2A(8+X)
    :X=X+1:A(P)=
    A(P)+4A(8+X)
    :GOTO 60
  6:"UP"A(P)=A(P
    )+A(8+X):Y=Y
    -1:A(P-1)=A(
    P-1)+8A(8+X)
    :GOTO 60
  7:"DOWN"A(P)=A
    (P)+8A(8+X):
    Y=Y+1:A(P+1)
    =A(P+1)+A(8+
    X):GOTO 60
 10:INPUT "RANDO
    M SEED? ";Z:
    PRINT "RND S
    EED=";Z
 20:INPUT "HEIGH
    T OF MAZE? "
    ;Q:PRINT "HE
    IGHT  = ";Q:
    Q=Q-1
 30:FOR X=31TO 3
    1+Q:A(X)=0:
    NEXT X
 40:FOR X=0TO 6:
    A(8+X)=16^X:
    NEXT X
 50:A(31)=1:X=0:
    Y=0:R=(Q+1)*
    7
 60:R=R-1:PAUSE
    R;" CELLS TO
     GO":IF R=0
    GOTO 300
 70:S=0:U=Y
 80:IF XLET T=X-
    1:GOSUB 3:IF
    W=0LET S=1:A
    $(27)="LEFT"
 90:IF X<6LET T=
    X+1:GOSUB 3:
    IF W=0LET S=
    S+1:A$(26+S)
    ="RIGHT"
100:T=X
110:IF YLET U=Y-
    1:GOSUB 3:IF
    W=0LET S=S+1
    :A$(26+S)="U
    P"
120:IF Y<QLET U=
    Y+1:GOSUB 3:
    IF W=0LET S=
    S+1:A$(26+S)
    ="DOWN"
130:IF SGOSUB 2:
    P=31+Y:GOTO
    A$(27+INT (Z
    S))
140:X=X+1:IF X>6
    LET X=0:Y=Y+
    1:IF Y>QLET
    Y=0
150:T=X:U=Y:
    GOSUB 3:IF W
    GOTO 70
160:GOTO 140
300:"D"PRINT " "
    :FOR U=0TO Q
    :FOR T=0TO 6
    :GOSUB 3
310:IF W/2=INT (
    W/2)LET A$(T
    +1)="+-":
    GOTO 330
320:A$(T+1)="+ "
330:NEXT T:PRINT
    A$;B$;C$;D$;
    E$;F$;G$;"+"
340:FOR T=0TO 6:
    GOSUB 3:IF W
    >7LET W=W-8
350:IF W<4LET A$
    (T+1)="I ":
    GOTO 370
360:A$(T+1)="  "
370:NEXT T:PRINT
    A$;B$;C$;D$;
    E$;F$;G$;"I"
380:NEXT U:PRINT
    "+-+-+-+-+-+
    -+ +"
```

Twonky Revisited

G. R. Hertel

My TRS-80 arrived early in 1978. Unable to wait for Level II, I had "taken the plunge" with a 16K Level I machine. I spent hours learning and experimenting with the limitations and surprising capabilities of Level I.

One of the first "real" programs I entered was a game from *Creative Computing* (May-June, 1977). The game, by Mark Capella, was called Twonky.

From the description it looked like an interesting game and the challenge of translating it into Level I Basic made it doubly appealing. Once the conversion of the two-dimensional matrix into the single available one-dimensional array was worked out, the translation went smoothly and the program worked. It proved to be an interesting game.

In case you have misplaced your May-June 1977 issue of *Creative Computing*, let me briefly explain Twonky. In the game, you are trapped in a 15 x 15 square maze which contains blocked squares, relocation squares (which randomly relocate you), an objective, a super-maze square (which starts the game over by setting up a new maze), and a Twonky.

To win you must reach the objective square before the Twonky reaches you. The Twonky chases you relentlessly, oblivious to all obstacles, and your only options are to run from him or shoot him. If hit, he is relocated randomly somewhere in the maze.

The only real problem is that you play this whole game in the dark. After every move, the computer tells you the distance between you and the objective and between you and the Twonky.

Level I proved to be a more powerful programming language than I had expected, but, when Level II chips became available, I was ready. I had my TRS-80 upgraded and took off into a multi-dimensional, multi-functional world. I eventually returned to Twonky and typed in the program essentially as it was originally written.

It was the same game, of course, except that it ran much faster. I dressed the game up with some graphics and gave the player a "malfunctioning tricorder which was activated by the relocation field." It printed the maze and flashed your position, the Twonky, and the objective for a few seconds (I always did want to see the maze) whenever you were relocated.

Twonky was eventually stored away and almost forgotten.

Recently, I was introduced to the game of Chase (I admit I haven't been keeping up on computer games) on a computer that wasn't really meant to play games. As games go, it did not impress me.

The program was rather cumbersome; movement was slow and not at all exciting. It occurred to me, however, that it would be rather easy to put TRS-80 graphics into the game and make it really interactive.

(For those readers, like me, who are not familiar with computer games, Chase plunks you down in a field containing electrified posts and surrounded by an electrified fence. There are several robots who continuously move toward you. Both you and the robots are annihilated upon hitting a post, so the object of the game is to maneuver the robots into posts as they chase you through the field.)

I wrote a version of Chase for my TRS-80 to see how fast it would run. I used the INKEY$ function and the four arrow keys to control direction and movement in real time. The game uses surprisingly little memory and is fun to play.

You are represented by a single TRS-80 graphics location (rectangle), and the electrified posts and robots are double locations or squares. The robots come at you relentlessly, trying to catch you. You destroy them by maneuvering them into one of the posts or into each other.

In my version, a robot-post encounter annihilates both. You lose if caught or if you run into a post or the border. There are three rounds of play in a game. The number of robots increases from 4 to 8 to 12 while the number of posts decreases from 80 to 60 to 40. (See Listing 1.)

While writing and playing this version

G. R. Hertel, 1500 Hibiscus Avenue, Winter Park, FL 32789.

of Chase, the similarity between robots chasing you and the Twonky chasing you occurred to me and I modified the game to conform more to the characteristics of Twonky.

In the new version, called Pursuit (Listing 2), there is one Twonky who chases you relentlessly as you try to thread your way through the maze to the flashing objective square. The Twonky homes in on you and lets nothing stand in his way.

Running into a wall either stops you cold (the blocked squares of the original game) or flips you randomly to some other spot in the maze (the relocation squares). Movement is controlled by the four arrow keys and can get frantic as the Twonky draws near or cuts off your escape route.

The darkness of the original Twonky game is gone (I always did want to see that maze) and so is the zap gun—you just don't have time to shoot in this version. It's real-time fun.

The game is set up to give you three chances, but the maze is more difficult each time. The goal (objective), Twonky, and you are identified in the game of

Program Notes for Chase

Lines 60-90 draw the border.

Lines 100-110 position posts.

Lines 120-150 select and store robot positions.

Lines 160-170 select an empty position for your starting location.

Line 180 moves you.

Lines 190-230 scan the keyboard for instruction and convert any received into horizontal or vertical instruction.

Lines 240-330 control robot movement.

The remainder of the program includes the beginning and ending routines.

Upon depressing an arrow key, you will move in that direction — one unit per move. Depressing the same key again will double your speed to two locations per move. By depressing the opposite direction key, you can slow down, stop, and reverse direction. The maximum speed is limited to two units per move.

The robots move at the constant speed of one unit per move. Thus, you can outrun the robots and even leap over posts. Diagonal movement is possible for both you and the robots.

Listing 1. Chase.

```
10 CLEAR 100
20 DEFINT A-Z
30 DIM X(30),Y(30)
40 GOSUB 390
50 W=0:R=4:ON ERROR GOTO 380
60 H=0:V=0:CLS:PRINT@1,STRING$(62,131)
70 FOR I=15360 TO 16320 STEP 64
80 POKE I,191:POKE I+63,191:NEXT
90 PRINT@961,STRING$(62,176);
100 FOR I=1 TO 80-5*R:X=RND(124)+1:Y=RND(44)+1
110 SET(X,Y):SET(X+1,Y):NEXT
120 FOR I=1 TO R
130 X(I)=RND(123)+1:Y(I)=RND(45)+1
140 IF POINT(X(I),Y(I)) OR POINT(X(I)+1,Y(I)) THEN 130
150 SET(X(I),Y(I)):SET(X(I)+1,Y(I)):NEXT
160 X=RND(124)+1:Y=RND(44)+1
170 IF POINT(X,Y)THEN 160 ELSE SET(X,Y)
180 RESET(X,Y):X=X+H:Y=Y+V:IF POINT(X,Y) THEN 340 ELSE SET(X,Y)
190 I$=INKEY$:IF I$="" THEN 240
200 IF ASC(I$)<10 THEN H=H+2*ASC(I$)-17 ELSE 220
210 IF ABS(H)>2 THEN H=SGN(H)*2:GOTO 240 ELSE 240
220 IF ASC(I$)=10 THEN V=V+1 ELSE V=V-1
230 IF ABS(V)>2 THEN V=SGN(V)*2
240 C=0:FOR I=1 TO R:IF X(I)=0 THEN 330
250 C=C+1:RESET(X(I),Y(I)):RESET(X(I)+1,Y(I))
260 X(I)=X(I)+SGN(X-X(I))
270 Y(I)=Y(I)+SGN(Y-Y(I))
280 IF (X(I)=X OR X(I)+1=X) AND Y(I)=Y THEN 370
290 IF POINT(X(I),Y(I)) OR POINT(X(I)+1,Y(I)) THEN 310
300 SET(X(I),Y(I)):SET(X(I)+1,Y(I)):GOTO 330
310 RESET(X(I),Y(I)):RESET(X(I)+1,Y(I)):RESET(X(I)-1,Y(I))
320 RESET(X(I)+2,Y(I)):X(I)=0
330 NEXT:IF C=0 THEN 350 ELSE 180
340 CLS:PRINT CHR$(23):PRINT@524,"Y O U   L O S E !":GOTO360
350 CLS:PRINTCHR$(23):PRINT@522,"Y O U   W I N ! ! !":W=W+1
360 FOR I=1 TO 1000:NEXT:R=R+4:IF R<13 THEN 60 ELSE 420
370 CLS:PRINT CHR$(23):PRINT@530,"G O T C H A ! ! !":GOTO360
380 RESUME 340
390 CLS:PRINTCHR$(23):PRINT@470,"C H A S E"
400 PRINT@800,"BY G. R. HERTEL"
410 FOR I=1 TO 1500:NEXT:RETURN
420 CLS:PRINTCHR$(23):IF W<3 THEN 450
430 PRINT@200,"Y O U   D I D   I T ! !":PRINT@454,"YOU WON ALL THREE TIMES!"
440 PRINT@704,"C O N G R A T U L A T I O N S !":GOTO 480
450 IF W=2 PRINT@396,"TWO OUT OF THREE":PRINT@592,"NOT TOO BAD!":GOTO 480
460 IF W=1 PRINT@390,"YOU WON ONCE - BIG DEAL."
470 IF W=0 PRINT@386,"HA-HA-HA -- YOU LOST THEM ALL."
480 A$=INKEY$:FOR I=1 TO 500:NEXT:PRINT@900,"CARE TO TRY AGAIN (Y/N)?";
490 A$=INKEY$:IF A$="" THEN 490
500 IF A$="Y" THEN 50
510 IF A$<>"N"THEN 480
```

LEARN TO PLAY LIKE A PRO WITH

The Survival Kit for Apple Computer Games

by Raymond Spangenburg and Diane Moser

Learn how to play more than two dozen of the most popular computer games like a pro. And, the better you get, the more challenges there are in store for you. **THE SURVIVAL KIT FOR APPLE COMPUTER GAMES** covers games in four categories—Adventure, Arcade, Fantasy, and Strategy. For each game you'll find detailed, fun-to-read descriptions, winning strategies, tips from experts—players, programmers, and game designers—and the authors' personal quality rating. All the games run on the Apple home computer, and hardware requirements tell you at a glance on what other machines you can play each game.*

Illustrated. Paperbound. Available December 11, 1982.

*Many games run on the Atari 400 or 800, the TRS-80, and the IBM PC.

Plus...to help you keep up to date in this fast-paced world, you'll want the

COMPUTER ERA 1983 CALENDAR.

This 9" x 12" full-color calendar has plenty of room for your own important input while relating the history of computing through facts and photographs.

WADSWORTH ELECTRONIC PUBLISHING COMPANY
10 Davis Drive • Belmont • CA 94002

ALL ORDERS MUST BE PREPAID AND SHOULD BE SENT TO: WADSWORTH ELECTRONIC PUBLISHING CO., 10 DAVIS DRIVE, BELMONT, CA 94002. (Postage and handling will be paid by publisher.)

Please send me:

___ copies of THE SURVIVAL KIT FOR APPLE COMPUTER GAMES @ $9.95 each (I understand that the book will not be available until 12/11/82) $______

___ copies of the 1983 COMPUTER ERA CALENDAR @ $6.95 each (available now) $______

Residents of CA and KY please add appropriate sales tax $______

☐ Enclosed is my check **Total** $______

☐ Please charge my ☐ Visa ☐ Mastercard

Account # ______ Exp. Date ______

Name ______

Address ______

City ______ State ______ Zip ______

Signature ______

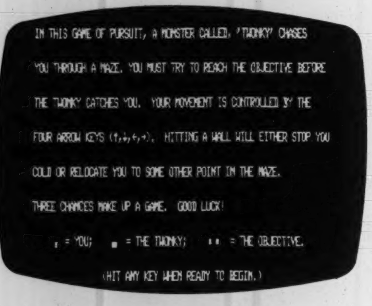
CIRCLE 364 ON READER SERVICE CARD

Pursuit before the maze is drawn the first time.

There are enough differences between these two games to give each its own flavor. Chase runs initially at a slower pace since movement of several robots and you must be looped through successively.

As robots are destroyed, the game speeds up until, when you and just one robot remain, you are really moving.

In Pursuit, the cycle through which the program loops moves you and the Twonky, and flashes the objective. The pace is fast and constant. In order to keep the pace fast, "relocation squares" are not specific sites. Relocation may occur (30% chance) whenever you hit a wall. Also, your destination upon relocation is not checked.



```
IN THIS GAME OF PURSUIT, A MONSTER CALLED, 'TWONKY' CHASES

YOU THROUGH A MAZE. YOU MUST TRY TO REACH THE OBJECTIVE BEFORE

THE TWONKY CATCHES YOU.  YOUR MOVEMENT IS CONTROLLED BY THE

FOUR ARROW KEYS (↑,↓,←,→).  HITTING A WALL WILL EITHER STOP YOU

COLD OR RELOCATE YOU TO SOME OTHER POINT IN THE MAZE.

THREE CHANCES MAKE UP A GAME.  GOOD LUCK!

     ▖ = YOU;    ▪ = THE TWONKY;     ▪▪ = THE OBJECTIVE.

              (HIT ANY KEY WHEN READY TO BEGIN.)
```

Program Notes for Pursuit

Lines 60-90 draw the border.

Lines 100-140 pick sites for you, the objective, and the Twonky; 140 checks to be sure the Twonky isn't sitting on top of you or your goal.

Lines 170-190 set up the maze.

Lines 200-220 move you, checking to see if you have hit a wall. If so, you are stopped and possibly relocated.

Lines 230-270 check for instruction from keyboard and convert it into a vertical or horizontal direction command.

Line 280 flashes the goal.

Lines 290-330 determine which way to move the Twonky.

Line 340 checks to see if you have been caught.

Line 360 checks to see if you have entered the goal.

Line 370 flashes the goal again and starts the process over.

The remainder of the program includes the beginning and ending routines.

Upon depressing an arrow, you will move in that direction until hitting a wall or depressing the opposite arrow key. Diagonal movement is possible for you, but not for the Twonky (you must have some advantage).

As a result, you may find yourself inside a wall.

Don't give up, just keep trying to move out. Eventually that random number generator will come up in your favor and you will be relocated—if the Twonky doesn't get there first!

Instructions for Chase are omitted from the listing, but could be added if desired. There are brief instructions included in the Pursuit listing. Obviously, these are games designed specifically for the TRS-80. They are based upon TRS-80 graphics and functions. ☐

Listing 2. Pursuit.

```
10 CLEAR 100
20 DEFINT A-Z
30 GOSUB 430
40 W=0:R=0
50 RANDOM:ON ERROR GOTO 420
60 H=0:V=0:CLS:PRINT@1,STRING$(62,131)
70 FOR I=15360 TO 16320 STEP 64
80 POKE I,191:POKE I+63,191:NEXT
90 PRINT@961,STRING$(62,176);
100 X=RND(123)+1:Y=RND(41)+3:SET(X,Y)
110 GX=RND(122)+2:GY=RND(41)+3
120 SET(GX,GY):SET(GX+1,GY):SET(GX-1,GY):SET(GX+2,GY)
130 TX=RND(123)+1:TY=RND(41)+3
140 IF POINT(TX,TY) OR POINT(TX+1,TY) THEN 130
150 A$=INKEY$:RESET(GX,GY):RESET(GX+1,GY)
160 SET(TX,TY):SET(TX+1,TY):GOSUB 490
170 FOR I=1 TO 100+R*50:POKE 15360+RND(1023),191
180 A=RND(13)*64+RND(60):POKE 15424+A,140
190 POKE 15425+A,140:POKE 15426+A,140:NEXT
200 RESET(X,Y):X=X+H:Y=Y+V:IF NOT POINT(X,Y) THEN 230
210 X=X-H:Y=Y-V:H=0:V=0
220 IF RND(0)>.7 THEN X=RND(124)+1:Y=RND(45)+1
230 SET(X,Y):I$=INKEY$:IF I$="" THEN 280
240 IF ASC(I$)<10 THEN H=H+2*ASC(I$)-17 ELSE 260
250 IF ABS(H)>1 THEN H=SGN(H):GOTO 280 ELSE 280
260 IF ASC(I$)=10 THEN V=V+1 ELSE V=V-1
270 IF ABS(V)>1 THEN V=SGN(V)
280 SET(GX,GY):SET(GX+1,GY):RESET(GX-1,GY):RESET(GX+2,GY)
290 RESET(TX,TY):RESET(TX+1,TY):IF TX=X OR TX+1=X THEN 330
300 IF TY=Y THEN 320
310 ON RND(2) GOTO 320,330
320 TX=TX+SGN(X-TX):GOTO 340
330 TY=TY+SGN(Y-TY)
340 IF (TX=X OR TX+1=X) AND TY=Y THEN 410
350 SET(TX,TY):SET(TX+1,TY)
360 IF (X=GX OR X=GX+1)AND Y=GY THEN 390
370 RESET(GX,GY):RESET(GX+1,GY):SET(GX-1,GY):SET(GX+2,GY):GOTO 200
380 CLS:PRINT CHR$(23):PRINT@524,"Y O U   L O S E !":GOTO400
390 CLS:PRINTCHR$(23):PRINT@522,"Y O U   W I N ! ! !":W=W+1
400 FOR I=1 TO 1000:NEXT:R=R+1:IF R<3 THEN 50 ELSE 580
410 CLS:PRINT CHR$(23):PRINT@530,"G O T C H A ! ! !":GOTO400
420 RESUME 380
430 CLS:PRINTCHR$(23):PRINT@400,"P U R S U I T"
440 PRINT@672,"BY G. R. HERTEL"
450 PRINT@896,"DO YOU WISH INSTRUCTIONS (Y/N)?"
460 A$=INKEY$:IF A$=""THEN 460
470 IF A$="N" RETURN
480 IF A$="Y" THEN 690 ELSE 450
490 IF R>0 THEN 550
500 IF X>110 THEN P1=64*INT(Y/3)+(X-10)/2 ELSE P1=64*INT(Y/3)+(X+4)/2
510 IF GX>100 THEN PG=64*INT(GY/3)+(GX-22)/2ELSE PG=64*INT(GY/3)+(GX+6)/2
520 IF TX>100 THEN PT=64*INT(TY/3)+(TX-24)/2 ELSE PT=64*INT(TY/3)+(TX+6)/2
530 PRINT@P1,"YOU!";:PRINT@PG,"THE GOAL!";:PRINT@PT,"THE TWONKY!";
540 FOR I=1TO2500:NEXT
550 FOR I=1 TO 1500:NEXT:IF R>0 RETURN
560 PRINT@P1,"    ";:PRINT@PG,"         ";:PRINT@PT,"           ";
570 RETURN
580 CLS:PRINTCHR$(23)
590 IF W<3 THEN 620
600 PRINT@200,"Y O U   D I D   I T ! !":PRINT@454,"YOU WON ALL THREE TIMES!"
610 PRINT@704,"C O N G R A T U L A T I O N S !":GOTO 650
620 IF W=2 PRINT@396,"TWO OUT OF THREE":PRINT@592,"NOT TOO BAD!":GOTO 650
630 IF W=1 PRINT@390,"YOU WON ONCE - BIG DEAL."
640 IF W=0 PRINT@386,"HA-HA-HA -- YOU LOST THEM ALL."
650 A$=INKEY$:FOR I=1 TO 500:NEXT:PRINT@900,"CARE TO TRY AGAIN (Y/N)?";
660 A$=INKEY$:IF A$="" THEN 660
670 IF A$="Y" THEN 40
680 IF A$="N"THEN END ELSE 650
690 CLS:PRINT"IN THIS GAME OF PURSUIT, A MONSTER CALLED, 'TWONKY' CHASES":PRINT
700 PRINT"YOU THROUGH A MAZE. YOU MUST TRY TO REACH THE OBJECTIVE BEFORE":PRINT
710 PRINT"THE TWONKY CATCHES YOU.  YOUR MOVEMENT IS CONTROLLED BY THE":PRINT
720 PRINT"FOUR ARROW KEYS (^,"CHR$(92);",";CHR$(93);",";CHR$(94);").  HITTING A
WALL WILL EITHER STOP YOU":PRINT
730 PRINT"COLD OR RELOCATE YOU TO SOME OTHER POINT IN THE MAZE.":PRINT
740 PRINT"THREE CHANCES MAKE UP A GAME.  GOOD LUCK!":PRINT
750 PRINTTAB(5);CHR$(132);" = YOU;     ";CHR$(140);"  = THE TWONKY;";TAB(42);"= T
HE OBJECTIVE.":PRINT
760 PRINTTAB(15);"(HIT ANY KEY WHEN READY TO BEGIN.)"
770 PRINT@806,CHR$(132)+CHR$(136);:A$=INKEY$:FOR I=1TO50:NEXT
780 IF A$="" THEN PRINT@806,CHR$(136)+CHR$(132);:FOR I=1TO 50:NEXT:GOTO 770
790 RETURN
```

- Attributes: inverse, half intensity, underline, alternate character set and almost any combination of the above via 12 bit X 2K memory
- 7 X 9 or 7 X 11 dot matrix with descenders
- Electronic switching between 40 and 80 columns
- Pascal 1.1 Basic, CPM™, Fortran, Cobol and standard Apple peripheral compatible
- 256 Character set
- Full upper and lower case letters with shift key detector
- And other features not listed, call for details.

SuperVision

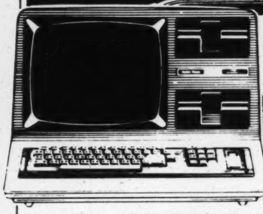
An Apple™ 80 column board

By Techcom Enterprises
16819 So. Hawthorne Blvd.
Lawndale, Calif. 90260
CALL (213) 854-0583

Suggested Price **$350.00**

™Apple Computer Company, Inc.
™Digital Research, Inc.

CIRCLE 351 ON READER SERVICE CARD



DISCOUNT

TRS-80®

TRS-80 MODEL III
$1950 48-K 26-1066
$819 16-K 26-1062

TRS-80 MODEL II
$3000 64-K 26-4002

TRS-80 MODEL 16
$4825 128-K 26-6002

TRS-80 8.4 MEGABYTE HARD DISKS (PRIMARY UNIT) . . . $4000.

TRS-80 COLOR
$309 16-K 26-3004
$425 16-K 26-3002
$525 32-K 26-3003

WE HAVE COLOR DISK DRIVES 0 — **$475** 1-2-3 — **$315**

WE ALSO CARRY EPSON AND OKIDATA PRINTERS, XEROX 820 AND ALTOS COMPUTERS.
NO OUT-OF-STATE TAXES. T.M. TANDY CORP.

Sold with the manufacturer's limited warranty. Copies of such warranty may be obtained for review from Perry Oil and Gas Co.

PERRY OIL & GAS INC.
Dept No H-8 137 NORTH MAIN ST., PERRY, MICHIGAN 48872
PHONE (517) 625-4161 MICH

WE ACCEPT CERTIFIED CHECKS, CASHIERS CHECKS AND MONEY ORDERS.

FOR OUR PRICES, PLEASE CALL TOLL FREE
1-800-248-3823

CIRCLE 269 ON READER SERVICE CARD

Get MORE out of *VISICALC* With

V-UTILITY **$99.95**
COPYRIGHT © 1981 YUCAIPA SOFTWARE Version 5.0

SPECIFY COMPUTER MODEL

NOW AVAILABLE FOR
IBM PERSONAL COMPUTER (PC DOS)
APPLE II (DOS 3.2 and DOS 3.3)
TRS-80 MOD I, II, III and 16 (TRSDOS)

V-UTILITY CONSISTS OF ALL THESE VISICALC "USER FRIENDLY" UTILITY PROGRAMS ON ONE DISK RUN BY INDEX AND PROMPTS.

V-PRINT SELECT FROM 1 TO 16 COLUMNS AND PRINT THEM IN ANY ORDER. YOU MAY SPECIFY THE PRINT WIDTH OF EACH OF THE COLUMNS INDIVIDUALLY AND SELECT SPACES BETWEEN THE COLUMNS.

V-STAT PROGRAM COLLECTS DATA AUTOMATICALLY FROM THE VISICALC COLUMN AND CALCULATES NUMERICAL DISTRIBUTION, CORRELATION COEFFICIENT, REGRESSION ANALYSIS, CHI² TEST, AND T-TEST. YOU MAY SELECT THE COLUMNS FOR DATA ENTRY AND SPECIFY THE ROW# TO START AND ROW TO END DATA COLLECTION. PROGRAM IS EASY TO RUN.

V-PLOT THIS PROGRAM AUTOMATICALLY INPUTS DATA FROM A VISICALC COLUMN, PERFORMS AUTO SCALING THEN PLOTS EITHER 1 OR 2 COLUMNS ON A REGULAR LINE PRINTER (GRAPHICS NOT REQUIRED). IDEAL FOR ANALYZING UP TO 250 NUMERICAL DATA POINTS IN RELATION TO TIME.

V-OVERLAY PROVIDES THE FOLLOWING SELECTION OF OVERLAYS TO LOAD ON TO THE VISICALC SHEET. MOVING AVERAGES, EXPOTENTIAL SMOOTHING EQUATIONS, TIME SERIES TREND ANALYSIS, DATE COLUMNS.

YUCAIPA SOFTWARE
12343 12TH ST · YUCAIPA·CA·92399
PHONE (714) 797-6331

SHIPPING & COD $3.00

IBM, APPLE, TRS-80, and VISICALC are trademarks respectively of International Business Machines Corp, Apple Computer Inc, Tandy Corp, and VisiCorp

CIRCLE 366 ON READER SERVICE CARD

DOS Kapital

John P. Humble

When I saw the way that my friend loaded and ran programs on his Apple computer I was a bit jealous. On my Atari I had to go through a process of making sure that I had the right disk and then making sure I didn't forget how to spell the title of the program and then typing it in.

The following is a little program that will help. I have saved this program on all my disks as MENU and now all I have to do is boot the system and type RUN D:MENU to get a list of what is in the directory of the disk. I then type the letter that is next to the name of the program that I want to run and MENU loads and runs it from the disk.

John P. Humble, 9003 W. Shorewood Dr., Apt. 703, Mercer Is., WA 98040.

```
10 GRAPHICS 0:OPEN #2,4,0,"K"
20 DIM FILENAME$(23*17),FILE$(17),F$(20)
30 OPEN #1,6,0,"D:*.*"
40 TRAP 900
45 FOR X=1 TO 64
50 INPUT #1,FILE$
55 IF FILE$(5,16)="FREE SECTORS" THEN 70
60 PRINT CHR$(64+X);"  ";FILE$:FILENAME$((X-1)*16+1,(X-1)*16+16)=FILE$
65 NEXT X
70 PRINT :PRINT "TYPE LETTER"
75 GET #2,A:A=A-64
77 FILE$=FILENAME$((A-1)*16+3,(A-1)*16+13)
80 F$="D:"
81 FOR X=1 TO 8
82 IF FILE$(X,X)=" " THEN 85
83 F$(LEN(F$)+1)=FILE$(X,X)
84 NEXT X
85 F$(LEN(F$)+1)="."
90 F$(LEN(F$)+1)=FILE$(9,11)
100 RUN F$
900 END
```

Sample output.

```
A DOS.SYS

B DUP.SYS

C MENU

D DISASSEM.BAS

E FLAG

TYPE LETTER
```

Input Without Carriage Return/Line Feed

Tom Disque

While in the process of writing a payroll and accounts receivable/payable system in TRS-80 Model I disk Basic, I encountered a perplexing problem. I wanted to display a complete record with as many as 30 fields on the screen, and to use the same section of coding as a subroutine to display the record whether adding or changing it. If the record were scrolled off the screen, one would not be able to view (and compare) all the fields of the record at one time.

When I began work on the program, I thought this would pose no problem. I had already set up the subprogram that would print out the table in Figure 1. I would simply put a semi-colon after the INPUT statement when adding a field (or PRINT when displaying fields for changes), but it didn't work.

The INPUT still prints the carriage return/line feed and wipes out the rest of the current line, as well as the next line. Then I had the idea of using the INKEY$ function, which gave birth to the program in Listing 1.

Although the subprogram is fairly simple, a couple of items should be pointed out. The check for X=8 in line 10020 is looking for a backspace. The THEN condition will take care of the variable **A$**, and the PRINT B$ in line 10030 will wipe out the last character on the display. The ELSE condition of line 10020 is looking for X=10 through 13, because the TRS-80 level II manual gives all four of those as the ASCII value for a carriage return.

Listing 2 gives the subprogram I used to print out the finished record. ☐

Tom Disque, Rt. 7, Waldrop Drive, Mayfield, KY 42066.

Figure 1.

```
 1. EMPLOYEE NO.            16. GROSS PAY/QTR:
 2. NAME:                   17. GROSS PAY/YEAR:
 3. ADDRESS:                18. FICA/QTR:
 4. (address continued)     19. FICA/YEAR:
 5. SOC. SEC. NO.:          20. FED. TAX/QTR:
 6. MARITAL STATUS:         21. FED. TAX/YEAR:
 7. PAYROLL CLASS:          22. STATE TAX/QTR:
 8. COUNTY TAX STATUS:      23. STATE TAX/YEAR:
 9. WITH INSURANCE?         24. COUNTY TAX/QTR:
10. WITH UNIFORM?           25. COUNTY TAX/YEAR:
11. NO. OF EXEMPTIONS:      26. INSURANCE/YEAR:
12. MISC. W/H:              27. INSURANCE/QTR:
13. AMOUNT OF   :           28. UNIFORMS/QTR:
14. GROSS PAY/HR.:          29. UNIFORMS/YEAR:
15. STARTING DATE:
(bottom line reserved for computer query)
```

Listing 1.

```
10000 A$=""
10010 B$=INKEY$$:IF B$=""THEN 10010 ELSE X=ASC(B$)
10020 IF X=8 THEN A$=MID$(A$,1,LEN(A$)-1) ELSE IF X>9
        AND X<14 THEN RETURN ELSE A$=A$+B$
10030 PRINT B$;:GOTO 10010
```

Listing 2.

```
10040 FOR L=0 TO 15: FOR K=0 TO 63: LPRINT
CHR$(PEEK(15360+L*64+K));: NEXT: LPRINT: NEXT: RETURN
```

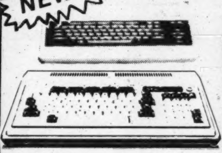
Our Name Means a Great Deal

NEC

PC-6000

Please call for details.

NEW!



PC-8001A Microcomputer (32K)	CALL
PC-8031A Dual mini-disk drives	CALL
PC-8012A I/O unit, 32K, 7 slots	489^{00}
NEC 8023 Printer	489^{00}
32K Memory Add-on card	179^{00}
RenTec RS-232 card for NEC	155^{00}
RenTec Wedge Expansion w/32K	489^{00}

NEC SOFTWARE

NEC CP/M Operating System	125^{00}
General Accounting System	249^{00}
Accounts Receivable System	249^{00}
Inventory Control System	249^{00}
Payroll System	249^{00}
Job Cost System	249^{00}
Select Word Processing w/Speller	349^{00}
Report Manager	149^{00}
Games Pack 1 Alien, Space War	29^{00}
Games Pack 2 UFO Galaxian, Bomber	29^{00}
Wordstar by Micropro	299^{00}
Datastar by Micropro	249^{00}
Mailmerge for NEC Wordstar	109^{00}
Supersort by Micropro	169^{00}
Racet NECDOS	CALL

More software and accessories everyday.

NEW **SANYO** computer

Please call for details.

Best terminal prices on. . .

ADDS

TeleVideo

commodore

We are a full-line Commodore Dealer.

Please Call for More Information

IBM® COMPATIBLE ACCESSORIES

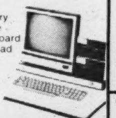
64K memory card by microsoft	379^{00}
128K memory card by "	499^{00}
192K memory card by "	659^{00}
256K memory card by "	799^{00}
64K ram chip upgrade kit	169^{00}
Serial Async. Comm. card w/1 port	129^{00}
Serial Async. card with 2 ports	249^{00}
Clock Calendar card	105^{00}
Combo Card by Apparat	235^{00}
Joystick for IBM	55^{00}
Expansion Chassis	CALL
Baby Blue Z-80 w/64K & CP/M	CALL
Percom mini-floppy drives (add-on)	CALL
Tandon TM 100 mini-floppy drives	CALL

FRANKLIN

THE FRANKLIN ACE FEATURES

- Apple II Compatible
- 64K RAM User memory
- Upper and lower case
- Typewriter style keyboard
- Twelve key numeric pad
- Alpha lock shift key
- VisiCalc friendly
- 50 watt power supply
- Built in Fan

Please call or write for more details.



BASIS

The BASIS 108 microcomputer features include both a Z-80 and 6502 processor. RAM capacity of 128K, 80 columns, upper/lower case, detachable keyboard, function keys, numeric keypad, and cursor block. It is completely compatible with all APPLE II hardware peripherals and software, along with being compatible with all CP/M based software.

PLEASE CALL US FOR MORE DETAILS

APPLE II COMPATIBLE Accessories

Prometheus VersaCard	219^{00}
CPS Multi-Function card	169^{00}
Hayes Micromodem II	289^{00}
Hayes Smartmodem	245^{00}
Novation Apple Cat modem	319^{00}
Videx VideoTerm 80 column card	245^{00}
Z-80 SoftCard by Microsoft	289^{00}
16K RamCard by Microsoft	155^{00}
ThunderClock/Calendar card	119^{00}
ALF 9 voice Music Card	149^{00}
Music System (16 voices) Mountain	299^{00}
Asychronous Serial card by CCS	139^{00}
Grappler Printer Interfaces	139^{00}

APPLE II COMPATIBLE DISK DRIVES

A2 with controller	469^{00}
A2 w/o controller	399^{00}
A40 with controller	479^{00}
A40 without controller	389^{00}
A70 with controller	599^{00}
A70 without controller	499^{00}

SOFTWARE

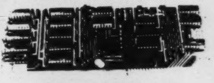
VisiCalc	185^{00}
VisiFile (Data Base Manager)	185^{00}
VisiTrend/VisiPlot	199^{00}
VisiSchedule (New!)	239^{00}
VisiTerm	89^{00}
Tax Preparer by Howard Soft	119^{00}
Real Estate Analyzer by "	119^{00}
PFS Personal Filing System	79^{00}
DB Master	165^{00}
Peachtree Accounting Software*	CALL
Continental Accounting Pkgs	199^{00}
WordStar by MicroPro*	199^{00}

Microsoft Software; we carry it all!

****Requires a Z-80 Soft-Card***

16K RamBoard

FOR APPLE II



$50^{00} KIT

ASSEMBLED & TESTED $69°°

VIC-20

The Friendly Computer

$239

VIC 1540 Single Disk Drive	469^{00}
Datasette Cassette I/O unit	65^{00}
Joystick Controller (pair)	20^{00}
VIC 1515 Graphic Printer	329^{00}
VIC Super Expander	54^{00}
8K Ram Cartridge	49^{50}
16K Ram Cartridge	99^{00}
VIC RS-232C Terminal interface	39^{00}
ViCalc - Viable Calculator (T)	11^{00}
AMOK (C)	31^{00}
The Alien (8K/T)	19^{00}

MONITORS

Amdek Video 300 12" Hi-Res Green	169^{00}
Amdek Color I 13" Color w/audio	379^{00}
Amdek Color II Hi-Res RGB	769^{00}
Amdek Apple II DVM RGB card	169^{00}
NEC 12" Hi-Res Green monitor	169^{00}
NEC 12" Composite Color	349^{00}
NEC 12" Hi-Res RGB Color	799^{00}
Sanyo 9" Green monitor	179^{00}
Sanyo 12" B&W	189^{00}
Sanyo 13" Color Monitor	369^{00}
Zenith 12" Green monitor	119^{00}

ATARI

Atari 800 (16K)		679^{00}
Atari 800 w/32K	729^{00} w/48K	769^{00}
Atari 400 (16K)		329^{00}
Bit 3 80 Column Card for 800		299^{00}
410 Program Recorder		79^{00}
810 Disk Drive		439^{00}
850 Interface Module		169^{00}
Atari Joysticks (pair)		20^{00}
Axlon Ramcram 32K module		149^{00}
Atari 16K Module by Microteck		69^{00}
EDU-PAKs Educational Tape Series		CALL
Pac-Man (cartridge)		34^{50}
Centipede (cartridge)		34^{50}

We carry all ATARI software and hardware.

PRINTERS

C. Itoh F-10 40 CPS (parallel)	1399^{00}
C. Itoh F-10 40 CPS (serial)	1450^{00}
Epson MX-80 T Type III w/graph	CALL
Epson MX-80 F/T Type III w/graph	CALL
Epson MX-82 F/T Type III w/graph	CALL
IDS Prism 132 with color	1589^{00}
NEC Spinwriters (most models)	CALL
NEC 8032 Impact Dot Matrix	489^{00}
Okidata 82A w/tractor, 80 col	469^{00}
Okidata 83A's & 84A's	CALL
Smith Corona Printer parallel	689^{00}

DISKETTES

Dysan 5¼" (Soft, 10 or 16 sectored)	10/39^{50}
Verbatim 5¼" (Soft 10 or 16 sect.)	10/29^{50}
Scotch 3M 5¼" (Soft, 10 or 16 sect.)	10/26^{50}
Same as above in quantity of 100	245^{00}
Scotch 3M Dr. Head Clean. Kit (5" & 8")	29^{00}

consumer computers **CATALOG SALES**

8338 Center Drive La Mesa, CA 92041

Toll Free 800-854-6654

Info & California 714 - 698-8088

We accept most major credit cards, bank wire transfer, money orders, cashiers or certified checks and personal checks (10 days to clear). Unless prepaid with cash please add 5% shipping, handling and insurance (min. $5.00). CA residents add 6% sales tax. Foreign customers please call for ordering information. All equipment is subject to price change and availability without notice. All equipment is new and complete with manufacturer's warranty. We have a 15 day satisfaction policy — call for details.

CIRCLE 159 ON READER SERVICE CARD

Finally . . . a name disk for a no name price! Available direct to you from I/O Management Corporation.

DATAPRO™ is an outstanding flexible disk manufactured with a flakeproof oxide coating burnished to prevent drive head maintenance and insure data integrity. Each disk is critically tested Read/Write 100% error free of bit drop in/drop out and after 12 million passes still retains accurate original output. DATAPRO™ is unsurpassed for high durability and low abrassiveness. QH-equipped with reinforced hub rings, consistent with all industrial magnetic media. Make all your input/output computing professional. Go with the pros.

GO DATAPRO.™

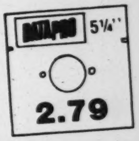
DATAPRO™

Flexible Disks

Division of I/O Management Corporation
463 Station Avenue, S. Yarmouth, MA 02664

IN MASS.: 1-617-322-0453
NATIONWIDE: 1-800-343-1292

Dealers welcome



DATAPRO
8''
1.79

Introductory offer.
Order 10 Pack or 5 Pack

In Mass.: 1-617-322-0453
Nationwide: 1-800-343-1292

☐Check (to Datapro™) ☐Money Order
☐M.C. ☐Visa Exp.__________
# __________
Computer __________ Hard Sector / Soft Sector
Name __________
Address __________
City__________ State______ Zip______
Phone __________

	# of 5¼" 5 pack	# of 5¼" 10 pack	# of 8" 10 pack	
SS/SD	9.95☐	17.90☐	27.90☐	______
SS/DD	13.45☐	21.90☐	29.99☐	______
DS/DD	19.95☐	34.90☐	39.99☐	______
DS/DD	17.45☐	29.90☐		
FLip Flop				______

Library case (holds 10) 2.50 ______
Retail Software Pkg. (1) 1.25 ______
UPS/Shp. & Handl. 2.00
5% Sales Tax (in Mass.) ______
Total ______

Please no C.O.D. or purchase orders.

CIRCLE 209 ON READER SERVICE CARD

C·H·E·C·K·E·R·S

John F. White

Many commercial programs for games of strategy are now available for microcomputers. J-Checkers has been written in Basic to illustrate some of the concepts and principles underlying these programs.

The Interpreted Basic found on virtually all microcomputers runs very slowly owing to the time required to interpret each statement. It is therefore very unusual to find a game of strategy written in this language.

Compiled languages (including the rare Compiled Basic), run about 100 times faster, while machine language is faster still. This is, therefore, the language of choice for commercial game programs. However, this leaves the rest of us unable to understand the program even when we read it.

It is customary for most programs to estimate the value of moving a piece by assessing the position which arises as a result of the move. For checkers, this would mean an assessment of each possible move of all 64 squares of the board by two FOR...NEXT loops. This is prohibitively slow in Interpreted Basic.

An alternative approach is used in Checkers, a 3 1/2 K checkers program described in *Basic Computer Games* from Creative Computing. I gratefully acknowledge the permission of David Ahl to reproduce and adapt the original Checkers for this article.

Checkers evaluates the merit of each move, instead of the position arising after the move. The evaluation table used for this is reproduced in Table 1.

The major problem with this approach is the poor strategic vision of the program. A piece threatened with capture will not be moved unless the move itself achieves something (other than saving the piece). The evaluation function can be built to recognize such threats to a limited extent, but the best protection is a "look-ahead" which evaluates the opponent's moves. Then the program can see that a capture by the opponent can only be averted by moving the threatened piece.

I do not have the space to consider the theoretical background behind "look-ahead." The interested reader is referred to David Levy's *Chess and Computers* (Batsford Publishers). However, it is not easy to implement recursive programming (a subroutine calling itself) in Basic and this leads to an unavoidable amount of duplication of program statements at each level of search in J-Checkers.

J-Checkers was written for a Sharp MZ-80K computer. I have used standard Microsoft Basic, but could not resist using the programmable music generator to give an audible prompt (these are the lines or subroutines with TEMP and MUSIC statements), and the use of a real-time clock is essential for the feature called Iterative Deepening (subroutine TIMER). Sharp owners will require a Tool-Kit or Expanded Basic for the string inequalities (A$<> "Y") in some lines, and for the logical operators AND and OR. I used Newbear's "Basic Extensions." PRINT"C" is a clear-screen command.

J-Checkers occupies 9K as written, or 8.3K without the instructions. Removal of all program spaces and REM statements should reduce memory requirements to less than 8K. You will be invited to select a method search from simple one-move look-ahead (one-ply), iterative deepening from one-ply or, at two-ply search, between pruned search, minimax or alpha-beta search.

Features of computerized games of strategy simulated in J-Checkers are listed below:

Evaluation Function

The evaluation function for J-Checkers is held in its own subroutine, and is summarized in Table 2 (compare with Table 1). A score is assigned to each projected move; by convention, a positive score is taken as good for the program and a negative score as bad.

I make no claim to be a good checkers player. Table 2 represents my idea of how to play, and many readers will undoubtedly wish to change the values.

Evaluation of Captures

Most programs evaluate captures until no more can be made. J-Checkers evaluates all captures to a depth of three-ply only. (This is included solely for illustration, and is frankly a waste of time for J-Checkers.) Note that double jumps are only seen by the program as a particularly favorable single jump, and it may assume

John F. White, 22, Starling Close, Woosehill, Wokingham, Berks RG11 2YY, England.

that the opponent's best reply is to use the second (captured) piece to retake the machine's piece. It would take a great deal of extra programming to avoid this.

Mini-Max Search

It is obvious that the moves made by the program can be influenced by the opponent's reply. J-Checkers contains two levels of calculation (two-ply: machine move/man move) with a third level for evaluation of captures only. At the second level, all of the opponent's replies are evaluated for each of the machine's moves. This is a slow business. The best opponent move is deducted from the machine's move to give the "backed-up" score for that move; obviously, the lower the opponent's score, the better for the program.

The moves made by the program can be influenced by the opponent's reply.

The best backed-up score is stored in location R(0), together with the moves which led to it. This avoids the necessity of storing all the moves. Finally, when all moves have been considered, the best move is displayed together with the best response which it considers that you have at your disposal.

This method of minimizing the best opponent's move so as to maximize the program's score is the famous Mini-Max search.

Alpha-Beta Search

It is not necessary to search all of the opponent's replies to see if a machine move is viable. If *any* opponent move makes the machine move worse than the one already stored as "best," then the machine need not consider any further opponent moves in response to that one machine move. This is the principle underlying the modern Alpha-Beta search, which gives identical results to Mini-Max search but in a shorter time since fewer moves are considered. (If you want to check this, be sure to remove the randomizing lines 730 and 1760 first.) Similar considerations would apply at higher levels, with the machine not needing to consider any further responses to opponent moves after finding one which is worse for the opponent.

To be really fast, the first moves generated would normally be sorted into order before applying the Alpha-Beta search, but this takes so much time in Basic as to be counter-productive for J-Checkers.

Table 1. Evaluation Function Used by Original Checkers

Projected Move	**Score**
Capture of opponent	+ 5
Advance of man to 8th rank (promotion to king)	+ 2
Move to side of board	+ 1
Back-up own piece from behind	+ 1
Do not approach enemy piece	- 2
Do not move off 1st rank	- 2

Table 2. Evaluation Function Used by J-Checkers

Projected Move	**Score**
Capture of opponent	+ 10 or + 30
Ability to make a 2nd capture after 1st	+ 9, + 10 or + 11
Advance man to 8th rank (promotion to king)	+ 2
Advance man to 7th rank	+ .3
Advance man to 6th rank	+ .2
Move man to side of board	+ 1
Move king to side of board or 1st or 8th rank	- .5
Do not move man to edge of board if it is moving to 8th rank	- 1.2
Do not approach enemy piece from front	- 3
Do not approach enemy king from rear	- 3
Back-up own piece from behind	+ 1
Do not move man off 1st rank	- 2.2
Attack enemy men from rear with king	+ 1
Move piece attacked from rear by enemy king	+ 2
Move king rather than man	+ .2
Occupy centre squares with king	+ .25
Bridge two enemy pieces with king	+ 3
Whether to exchange pieces (see text)	+ P3
Maintain opposition	+ .5
Do not move from square 3,5 (if enemy move) or from 6,4 (if program move)	- .2
END GAME: Additional functions called in the end game.	
Advance man with unopposed path to 8th rank	+ 1
If program is winning: attack enemy pieces on side or edge of board with king	+ 2
If program is losing:	
Keep king in double corner	+ 1.5
Move king towards double corner	+ .3
Keep king off side or edge of board	- .35

The opponent's best response is not printed, unlike MiniMax search, since only a good response has been found, not the best.

Interative Deepening

A very modern way of assessing moves is that of Iterative Deepening. A time is preset (for J-Checkers, use 20-150 seconds) and the machine evaluates its best move at the first level (one-ply). These moves are sorted, and subjected to Alpha-Beta search until the time runs out, at which time the best move so far discovered is displayed. Move-sorting wastes too much time for J-Checkers, but the best move at level 1 is examined first at level 2 if Iterative Deepening has been selected.

As is customary with this type of search, the move being considered by the machine is constantly displayed.

Iterative Deepening is only available for microcomputers with real-time clocks. Otherwise, this function will operate as a slightly slow Alpha-Beta two-ply search.

Pruned Search

Another popular way of searching moves in depth without spending too much time is by pruning out all moves which fail to meet a pre-determined criterion. J-Checkers can be selected to prune out all first

```
       Facsimile of Screen
        Detail in Mid-game

        FROM 6, 6 TO 7, 5

          1 2 3 4 5 6 7 8
        8 . X . O*. X . . 8
        7 O . . . . . . . 7
        6 . . . O . . . O 6
        5 . . . . . . X . 5
        4 . . . . . . . X 4
        3 . . X . . . . . 3
        2 . . . . . O . . 2
        1 . . O . O . O . 1
          1 2 3 4 5 6 7 8

               MOVE NO. 19

            MY TIME = 4.06

         YOUR TIME = 8.14

         END GAME

         FROM ?
```

level moves which don't achieve a positive score. This speeds up execution tremendously (see Table 3) and can give results similar to those derived by other means of searching, provided that the evaluation function is a good one. The great playing strength of the older Chess Challenger models, which used pruning, provides an excellent example.

Material Evaluation

The screen display of J-Checkers provides the opportunity to count the number of pieces on each side (one for a man, three for a king). This serves to tell whether one side has won (piece count is zero for opponent), and can also be used as in lines 1100 and 1110 to measure which side is ahead and to provide a parameter P3 which encourages exchanges of material if the program is ahead, and discourages exchanges if the program is losing. The use of P3 can be found in the third search level in line 1970. This is a commonly used algorithm found in many game programs.

End Game

For a variety of reasons, the end-game play of most computer programs (especially chess) is weaker than the mid-game. The best chess programs use extra evaluation functions when a predetermined level has been reached. Using the material evaluation outlined above, this feature has been mimicked in J-Checkers with an end-game subroutine (the program announces that it has entered its end-game).

Book Openings

Book openings can be essential if the program is to avoid opening traps. J-Checkers includes just one (line 480) to prevent the disastrous opening line: 2,6-1,5;3,3-4,4;1,7-2,6;4,6-5,5; 4,6x6,4; 7,3 x 5,5; 6,6 x 4,4; 5,3 x 3,5 x 1,7 when white is a piece up.

Random Moves

To prevent the machine always playing the same responses to its opponent, J-Checkers includes two randomizing lines (lines 730 and 1760) which randomly select between moves of equal merit.

J-Checkers can be selected to prune out all first level moves which don't achieve a positive score.

Screen Display

Far too many commercial programs provide beautiful and incomprehensible graphics for their games of strategy. J-Checkers uses the barest possible display to save memory. The number of moves is displayed as are the times elapsed for each player (the times are given in minutes and hundredths of a minute, not seconds).

Input of Moves

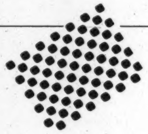
Several error-trapping routines have been written for J-Checkers, but the computer will not force you to make a capture (although it is required to do so).

In summary, J-Checkers, which uses a superior evaluation function and move searching, plays a much stronger game than the original Checkers, at the cost of two and a half times the memory requirement and between two and 22 times the original response period.

For the reasons given at the beginning of this article, it is unlikely to play as well as a machine-code program. ☐

Table 3. Average Time Spent on a Move.

Level	Search	Time (minutes)	% of maximum time
2	Minimax	2.24	100
2	Alpha-Beta	1.35	60
2	Pruned	0.45	20
1-2	Iterative Deepening (set to 45 seconds)	0.71	30
1	Level 1	0.21	10
1	Original "Checkers"	0.10	5



```
100 PRINT"■"
110 PRINTTAB(16);"J-CHECKERS"
120 PRINTTAB(5);" by Creative Computing\ J.F.White"
130 DIM R(4),T(4),S(8,8)
140 FORX=1TO8:FORY=1TO8:READJ:IFJ=15 THEN 160
150 S(X,Y)= J:GOTO170
160 RESTORE: READS(X,Y)
170 NEXT Y: NEXT X
180 DATA 1,0,1,0,0,0,-1,0,0,1,0,0,0,-1,0,-1,15
190 FORZ=1TO2000:NEXT:PRINT:PRINT:PRINT
200 PRINT"THIS IS THE GAME OF CHECKERS. BLACK IS ´X´ AND WHITE IS ´O´"
210 PRINT"SQUARES ARE REFERRED TO BY A COORDINATE SYSTEM"
220 PRINT"(1,1) IS THE LOWER LEFT CORNER"
230 PRINT"(1,8) IS THE UPPER LEFT CORNER"
240 PRINT"(8,1) IS THE LOWER RIGHT CORNER"
250 PRINT"(8,8) IS THE UPPER RIGHT CORNER"
260 PRINT:PRINT"THE COMPUTER WILL TYPE ´+ TO´
    WHEN YOU  HAVE ANOTHER JUMP"
270 PRINT:   PRINT    "TYPE ´0,0´ IF YOU CANNOT JUMP."
280 PRINT:PRINT"YOU WILL BE ASKED WHICH TYPE OF COMPUTER
    SEARCH YOU WANT"
290 PRINT"PRUNED SEARCH IS FASTER"
300 PRINT:PRINT:INPUT"SEARCH LEVEL(1-2)?";L
310 IFL=1 THEN 330
320 GOTO 360
330 INPUT"DO YOU WANT ITERATIVE DEEPENING(Y\N)?";ID$
340 IFID$="Y"THEN INPUT"SET TIME FOR SEARCH (SECS)";
    ST:AB$="Y":GOTO410
350 GOTO 410
360 INPUT"DO YOU WANT PRUNED SEARCH(Y\N)?";FA$
370 IF FA$="Y"THEN 410
```

PERIPHERAL VISION

Floppy Disk Services, Inc. is a contracted SIEMENS drive dealer. Do not let the prices fool you, we buy in very large quantities to get the best price and pass that savings on to you! All systems are of the highest grade components and our cabinets are custom designed with you in mind! If not 100% satisfied, call us and we will promptly refund your money. †

We carry Add-on drives for IBM, Radio Shack, Heath, Apple and most other microcomputers.

Apple II Add on drives	$329.00
Apple 8 inch controller	365.00
Apple 80 track dual system	1395.00
Apple dual 8 inch system w/ controller	1250.00
FDD-100-5b 'flippy' exact HEATH add on	235.00
FDD-200-5 double sided 40 track drive	250.00
FDD-111-5 5ms step IBM or MOD 3 Add on	245.00
FDD-221-5 5ms step 80 track DD/DS	350.00
TEC SFD-51B 5ms 5¼ 48TPI	215.00
FDD-100-8d 8 inch single side DD drive	340.00
FDD-200-8p Double sided 8 inch drive	445.00
Custom 8 inch and 5¼ inch enclosures	Call

System packages available for all drives ...	
Dual 8 inch system with EVERYTHING	935.00*
Dual double sided 8 inch system	1125.00*
Single 5¼ Heath or MOD I Add on w/ case	285.00*
Dual 5¼ Heath or MOD I	585.00*
10mb Hard Disk for any computer	2700.00*
CDR controller, allows any combo 8 and 5¼ inch drives to be added to your H88 or H89	Call

* 8 inch systems require minor assembly. Add $100.00 A&T. All 5¼ inch systems come assembled and tested.

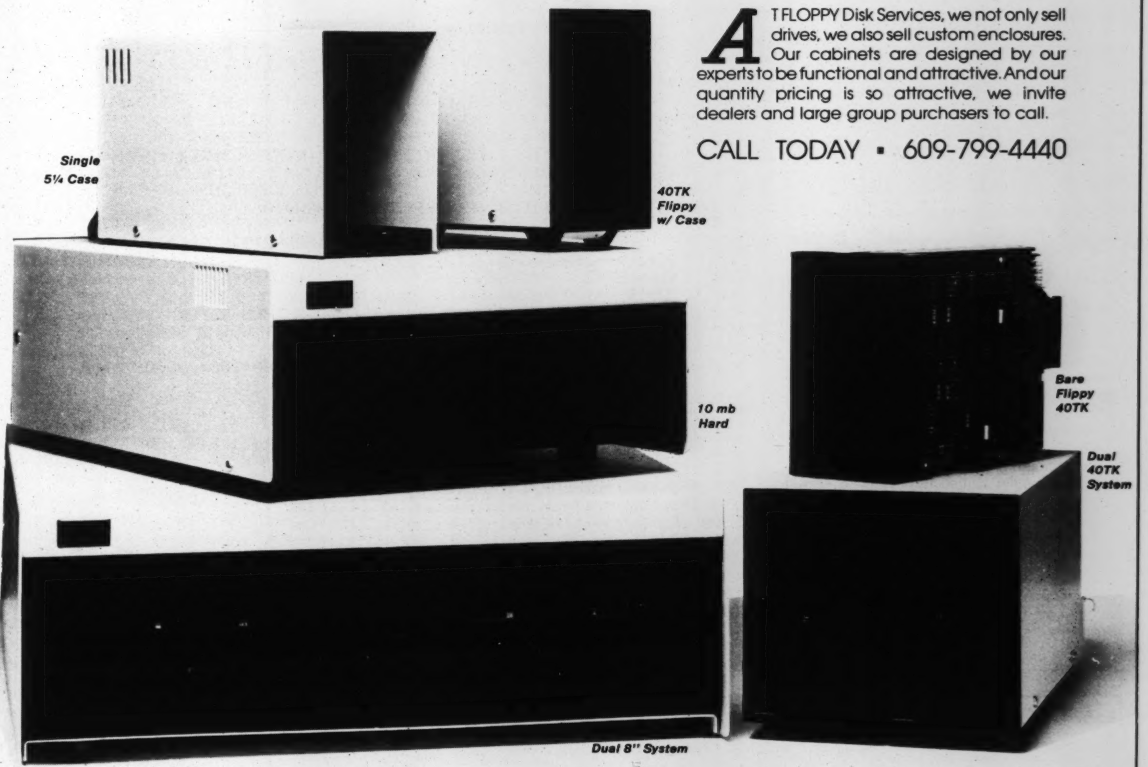
† Equipment must be in same condition as you received it.

WE HAVE ZENITH Z-100 SYSTEMS IN STOCK.

Have a disk drive in need of repair? We have expert techs ready to optimize your drives! Call us for info.

AT FLOPPY Disk Services, we not only sell drives, we also sell custom enclosures. Our cabinets are designed by our experts to be functional and attractive. And our quantity pricing is so attractive, we invite dealers and large group purchasers to call.

CALL TODAY ▪ 609-799-4440



IF you don't see what you want, give us a call between 9 am & 5 pm (ET). Chances are we'll have what you need for your system at your price. Due to production deadlines for advertising, prices in this ad are 2 months old, so we encourage you to call us for current prices and new product information.

PAYMENT POLICY – We accept Mastercard, VISA, personal checks & MO. We reserve the right to wait 10 working days for personal checks to clear your bank before we ship. All shipping standard UPS rates plus shipping & handling. NJ residents must add 5% sales tax.

FLOPPY DISK SERVICES INC.

741 ALEXANDER ROAD
PRINCETON, NJ 08540

PRICES & SPECIFICATIONS SUBJECT TO CHANGE

MOD I-II-III, CP/M are trademarks of Tandy and Digital Research respectively.

FD2-1

CIRCLE 193 ON READER SERVICE CARD

Happy Hands

Offers Discounts on All

TRS-80™

COMPUTERS

We Have What You Are Looking For

- ★ *Free Shipping Within United States*
- ★ *26-1066 Mod III 48K $1955.00*
- ★ *26-3004 16K Color 310.00*
- ★ *26-3002 16K Color Ext-Basic 410.00*
- ★ *26-3003 32K Color Ext-Basic 500.00*
- ★ *No Tax On Out of State Shipments*

For Additional Prices and
Shipping Information
Call Toll Free
1-800-545-9019
N.M. Residents Call 257-7865

or write

HAPPY HANDS
P.O. DRAWER I
RUIDOSO, NEW MEXICO
88345

CIRCLE 222 ON READER SERVICE CARD

SRA Educational Courseware: "Because learning matters"

Micro Discovery™ (Grade 4 and up)
For your Apple*, IBM*, or Radio Shack* personal computers.

A complete introduction to the personal computer for grades 4 and up. Gives practical, hands-on experience with computers and presents the basics of

- theory
- operation
- programming
- the computer and society

2 Diskettes, 20 copies of Student Workbook, and Instructor's Guide, $190.00.

*Registered trademarks.

☐ Yes! I want Micro Discovery! Please contact me immediately.
☐ Send me literature about Micro Discovery.

Name____________________
School____________________
Address____________________
City, State, Zip________________
Telephone____________________

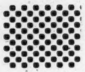
For faster service, call SRA toll-free:
(800) 621-0476
Or mail this coupon to:

SRA®

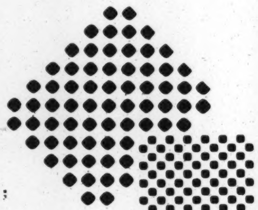
SCIENCE RESEARCH ASSOCIATES, INC.
155 N. Wacker Drive, Chicago, IL 60606

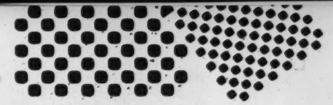
CIRCLE 332 ON READER SERVICE CARD

Checkers, continued...

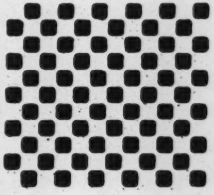


```
380 INPUT"DO YOU WANT ALPHA-BETA SEARCH (Y\N)?";AB$
390 IF AB$="Y"THEN 410
400 PRINT"DEFAULT TO MINIMAX SEARCH"
410 INPUT"DO YOU WANT TO GO FIRST(Y\N)?";C$
420 GOSUB2000:TB=TA
430 R(0)= - 99: G= -1:P1= 12:P2=12
440 IF C$="Y" THEN C1$="X":C2$="O":C3$="O*":C4$="X*":M=M+1:GOTO 910
450 C1$="O":C2$= "X": C3$ = "X*": C4$="O*"
460 M=M+1
470 IFID$="Y"ANDL=2THENX=R(1):Y=R(2):B=G:FORA=-1TO1STEP2:GOSUB570:NEXT
480 IFM=2 ANDS(2,6)=0THENR(1)=3:R(2)=7:R(3)=2:R(4)=6:GOTO790
490 FOR X = 1TO 8:FOR Y = 1 TO 8:IF S(X,Y)>-1 THEN520
500 IFS(X,Y)=-1 THEN B=G:FORA=-1 TO 1 STEP2:GOSUB570:NEXT
510 IFS(X,Y)=-2 THEN FORB=-1TO1 STEP2:FORA=-1 TO 1 STEP2:
    GOSUB570:NEXT:NEXT
520 NEXT Y : NEXTX
530 IFID$="Y" AND ID=0 AND L<2 THEN L=L+1:GOTO 470
540 ID = 0:IF ID$="Y" THEN L=1
550 GOTO 780
560 REM FIRST MOVE GENERATOR
570 IF ID=1 THEN RETURN
580 U=X+A:V=Y+B:IFU<1 OR U>8 ORV<1 OR V>8 THEN RETURN
590 IFS(U,V)=0 THEN GOSUB640:RETURN
600 IFS(U,V)<0 THEN RETURN
610 U=U+A: V=V+B: IFU<1 ORU>8 ORV<1 OR V>8 THEN RETURN
620 IFS(U,V) = 0 THEN GOSUB640
630 RETURN
640 UA=U:VA=V:XA=X:YA=Y:ED=1:GA=G
650 GOSUB 2040:Q0=Q
660 IF ID$="Y"THEN 700
670 IFQ0>8 THEN GOSUB 1480:GOTO720
680 IF FA$="Y" AND Q0   >0THEN GOSUB 1480:GOTO 720
690 IF FA$="Y" THEN 720
700 IF AB$="Y" AND L=2 THEN GOSUB 1480:GOTO720
710 IFL=2THEN GOSUB 1480:GOTO720
720 IFQ0 >R(0) THENR(0)=Q0:R(1)=X:R(2)=Y:R(3)=U:R(4)=V:GOTO 750
730 IFQ0=R(0)AND RND(1)>.5 THEN R(O)=Q0:
    R(1)=X:R(2)=Y:R(3)=U:R(4)=V:GOTO750
740 GOTO770
750 IFID$="Y"THENPRINT"I AM CONSIDERING ";R(1);",";R(2);" TO ";
    R(3);",";R(4)
760 T1=T(1):T2=T(2):T3=T(3):T4=T(4)
770 Q0=0:RETURN
780 IFR(0)=-99 THEN 1420
790 PRINT"■■■FROM ";R(1);",";R(2);" TO ";R(3);",";R(4):R(0)=-99
800 IFR(4)=1THENS(R(3),R(4))=-2 :GOTO820
810 S(R(3),R(4))=S(R(1),R(2))
820 S(R(1),R(2))=0:IFABS(R(1)-R(3))<>2THEN910
830 S((R(1)+R(3))/2,(R(2)+R(4))/2)=0
840 X=R(3):Y=R(4):IFS(X,Y)=-1THENB=-2:FORA=-2TO2STEP4:GOSUB880
850 IFS(X,Y)=-2THENFORA=-2TO2STEP4:FORB=-2TO2STEP4:GOSUB880:NEXT B
860 NEXTA:IFR(0)<>-99THENPRINT" TO ";R(3);",";R(4):R(0)=-99:GOTO800
870 GOTO910
880 U=X+A:V=Y+B:IFU<1 OR U>8 OR V<1 OR V>8 THEN RETURN
890 IFS(U,V)=0 AND S(X+A/2,Y+B/2)>0THEN ID=0: GOSUB 640
900 RETURN
910 PRINT:GOSUB2000:TD=TA:TF=TF+INT((TD-TB)/60*100+.00001)/100
920 P1=0:P2=0
930 FOR Y = 9 TO 0STEP-1:FORX=0TO 9
940 IFY=9AND(X=0 OR X=9)THEN 1030
950 IFY=0 AND (X=0 OR X=9)THEN 1030
960 IFY=0 OR Y=9THEN PRINTTAB(2*X-1);X;:GOTO1030
970 IF X = 0 OR X=9 THENPRINTY;:GOTO1030
980 IFS(X,Y)=0THENPRINTTAB(2*X);".";:GOTO1030
990 IFS(X,Y)= 1THEN PRINTTAB(2*X);C1$;:P1=P1+1:GOTO1030
1000 IFS(X,Y)=-1THENPRINTTAB(2*X);C2$;:P2=P2+1:GOTO1030
1010 IFS(X,Y)=-2THENPRINTTAB(2*X);C3$;:P2=P2+3:GOTO1030
1020 IFS(X,Y)=2THENPRINTTAB(2*X);C4$;:P1=P1+3
1030 NEXTX
1040 IFY=6 THENPRINTTAB(25);"MOVE NO. ";M;
1050 IFY=4 THENPRINTTAB(23);"MY TIME= ";TF;
1060 IFY=2 THEN PRINTTAB(21);"YOUR TIME= ";TG;
1070 PRINT:NEXT Y:PRINT
1080 IF P1=0 THEN 1410
1090 IFP2=0THEN1420
1100 IFP1>P2THENP3=(P1-P2)*P1/P2
1110 IFP2>P1 THEN P3=(P1-P2)*P2/P1
1120 IF P1<7 OR P2<7 THEN PRINT"END GAME "
1130 IFL=2 AND AB$<>"Y" AND FA$<> "Y" THEN 1150
1140 GOTO 1170
1150 PRINT"I have evaluated your best move as: ";
1160 PRINTT1  ;",";T2  ;" TO ";T3  ;",";T4
1170 GOSUB 1390
1180 GOSUB 2000:TE=TA
1190 PRINT:INPUT" FROM ";E,H:E=INT(E):H=INT(H)
1200 GOSUB 1390
1210 IFE<1ORE>8 ORH<1ORH>8THENGOSUB1440:GOTO1190
1220 IFS(E,H)<=0THENGOSUB 1440: GOTO1190
```





```
1230 INPUT" TO ";A,B:A=INT(A):B=INT(B)
1240 GOSUB 1390
1250 IFA<0ORA>8 ORB<0ORB>8THEN GOSUB1440:GOTO1230
1260 IFS(A,B)=0 AND ABS(A-E)<=2 AND ABS(A-E)=ABS(B-H) THEN1280
1270 GOSUB 1440: GOTO1190
1280 IFABS(A-E)=2 AND S((A+E)/2,(B+H)/2)>-1THENGOSUB1440:GOTO1190
1290 S(A,B)=S(E,H): S(E,H)=0: IF ABS(E-A)<>2 THEN 1350
1300 S((E+A)/2,(H+B)/2)=0
1310 INPUT" + TO ";A1,B1:GOSUB1390: IF A1<1 THEN 1350
1320 IFS(A1,B1)<>0 OR ABS(A1-A)<>2 OR ABS(B1-B)<>2
     THENGOSUB1440:GOTO1310
1330 E=A:H=B:A=A1:B=B1:IF B= 8 THEN S(A,B)=2
1340 GOTO1290
1350 IFB=8 THEN S(A,B)=2
1360 GOSUB2000:TB=TA:TG=TG+INT((TB-TE)/60*100+.0001)/100
1370 ID=0: GOTO 460
1380 REM BEEP-BEEP
1390 TEMPO3: MUSIC"¯C0","¯C0"
1400 RETURN
1410 PRINT:PRINT:PRINT"   I WIN !":PRINT:PRINT:END
1420 PRINT:PRINT:PRINT"  YOU WIN !":PRINT:PRINT:END
1430 REM REJECT MOVE
1440 TEMPO6:MUSIC"_C5"
1450 PRINT"ILLEGAL MOVE - TRY AGAIN"
1460 RETURN
1470 REM SECOND LEVEL
1480 IFID$="Y" THEN GOSUB 2000:IF TA-TB > ST-5 THENID=1: RETURN
1490 T(0)=-98:G1=1
1500 A7=S(X,Y):A8=S(U,V):S(U,V)=S(X,Y):S(X,Y)=0
1510 IF ABS(X-U)=2 THENA3=S((X+U)/2,(Y+V)/2):S((X+U)/2,(Y+V)/2)=0
1520 FOR X1=1TO8: FOR Y1=1TO8:IFS(X1,Y1)<1 THEN 1550
1530 IFS(X1,Y1)=1 THEN B1=G1:FORA1=-1TO1STEP2:GOSUB1620:NEXT
1540 IFS(X1,Y1)=2THENFORB1=-1TO1 STEP2:FORA1=-1TO1STEP2:GOSUB1620:
     NEXT:NEXT
1550 NEXTY1:NEXTX1
1560 S(X,Y)=A7: S(U,V)=A8
1570 IFABS(X-U)=2 THEN S((X+U)/2,(Y+V)/2)=A3
1580 Q0= Q0-T(0):IF FA$="Y"THEN Q0=Q0+3
1590 IFID$="Y"THEN Q0=Q0+ 3
1600 AB=0
1610 RETURN
1620 IF ID=1 OR AB=1 THEN RETURN
1630 U1=X1+A1: V1=Y1+B1:IFU1<1 ORU1>8 ORV1<1 OR V1>8 THEN RETURN
1640 IF S(U1,V1)=0 THEN GOSUB 1700:RETURN
1650 IF S(U1,V1)>0 THEN RETURN
1660 U1=U1+A1: V1=V1+B1:IF U1<1 OR U1>8 OR V1<1 OR V1>8 THEN RETURN
1670 IF S(U1,V1)=0 THEN GOSUB 1700
1680 RETURN
1690 REM SECOND MOVE GENERATOR
1700 UA=U1:VA=V1:XA=X1:YA=Y1:ED=8:GA=G1
1710 GOSUB 2040
1720 Q1=Q
1730 IF ID$<>"Y" AND Q1>8 THEN GOSUB 1800
1740 IFAB$="Y"AND Q0-Q1 < R(0) THEN AB=1
1750 IFQ1>T(0) THEN T(0)=Q1:T(1)=X1  :T(2)=Y1:T(3)=U1  :T(4)=V1
1760 IFQ1=T(0) AND RND(1)>.5 THEN T(0)=Q1:T(1)=X1:T(2)=Y1:T(3)=U1:
     T(4)=V1
1770 Q1=0
1780 RETURN
1790 REM THIRD LEVEL
1800 IFID$="Y"THEN GOSUB2000:IFTA-TB>ST-5THEN ID=1:RETURN
1810 A4=S(X1,Y1):A5=S(U1,V1):S(U1,V1)=S(X1,Y1):S(X1,Y1)=0
1820 IFABS(X1-U1)=2 THEN A6=S((X1+U1)/2,(Y1+V1)/2):
     S((X1+U1)/2,(Y1+V1)/2)=0
1830 FOR X2=1TO8: FOR Y2=1TO8
1840 IFS(X2,Y2)>-1 THEN 1870
1850 IFS(X2,Y2) = -1 THEN B2=G:FORA2=-1TO1 STEP2:GOSUB 1920:NEXT
1860 IFS(X2,Y2)=-2THEN FORB2=-1TO1STEP2:FORA2=-1TO1STEP2:GOSUB1920:
     NEXT:NEXT
1870 NEXTY2: NEXTX2
1880 S(X1,Y1)=A4:S(U1,V1)=A5
1890 IFABS(X1-U1)=2 THEN S((X1+U1)/2,(Y1+V1)/2)=A6
1900 RETURN
1910 REM THIRD MOVE GENERATOR
1920 U2=X2+A2:V2=Y2+B2:IF U2<1 OR U2>8 OR V2<1 OR V2>8 THEN RETURN
1930 IF S(U2,V2)<=0THENRETURN
1940 U2=U2+A2:V2=V2+B2:IF U2<1 OR U2>8 OR V2<1 OR V2>8 THEN RETURN
1950 IF S(U2,V2)=0 THEN GOSUB 1970
1960 RETURN
1970 Q1 = Q1 + P3 -9
1980 RETURN
1990 REM TIMER
2000 T1$=TI$
2010 TA=3600*VAL(LEFT$(T1$,2))+60*VAL(MID$(T1$,3,2))
     +VAL(RIGHT$(T1$,2))
2020 RETURN
2030 REM EVALUATION
```



Computer-Ed.

Of
Carmel, NY & Los Angeles, CA

99/4(A) Programs

- K-6 Reading
- K-6 Language Arts
- K-6 Math
  - Follow-up Games and Worksheets
  - Classroom Tested
  - Also Available for TRS-80 Level II

For
FREE Catalogue
Write To:

Computer-Ed.
1 Everett Rd.
Carmel, NY 10512

CIRCLE 370 ON READER SERVICE CARD

SRA Educational Courseware: "Because learning matters"

Computer Drill and Instruction: Mathematics (Grades 1-6)
For your Apple* and Atari* personal computers.

An outstanding program of drill and instruction in basic arithmetic skills. Can provide student placement, monitor progress, keep performance records, and generate seatwork at each learner's own level of skill.

Level A—Grades 1 and 2, $365.00
Level B—Grades 3 and 4, 495.00
Level C—Grades 5 and 6, 575.00
Levels A-C, Complete, 1195.00

Each level includes Binder with Lesson Diskettes and Teacher's Guide, plus Manager's Pack with Teacher and Student Diskettes. *Registered trademarks.

☐ Yes! I want CDI: Mathematics! Please contact me immediately.
☐ Send me literature.

Name
School
Address
City, State, Zip
Telephone

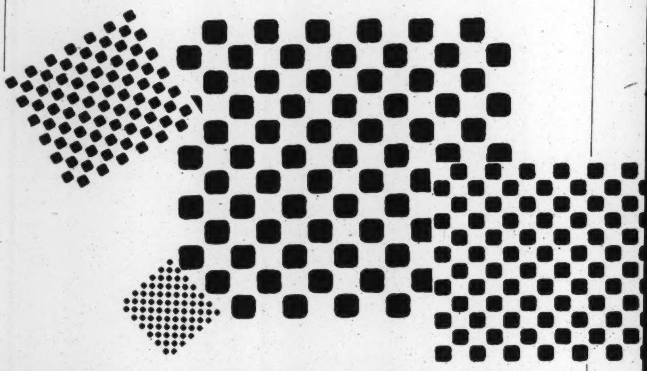
For faster service, call SRA toll-free:
(800) 621-0476

SRA®
SCIENCE RESEARCH ASSOCIATES, INC.
155 N. Wacker Drive, Chicago, IL 60606

CIRCLE 333 ON READER SERVICE CARD

Checkers, continued...

```
2040 Q=0: IF ID$="Y"THENGOSUB2000:
     IFTA-TB>ST-5 THENID=1:RETURN
2050 IFP1<7 OR P2<7 THEN GOSUB 2530
2060 CP=0:IF ABS(YA-VA)=2 THEN Q=Q+10:CP=1:
     IF GA=-1 THENQ=Q+20
2070 IF GA=-1 AND XA=3 AND YA=5 THEN Q=Q-.2
2080 IF GA =1 AND XA=6 AND YA=4 THEN Q=Q-.2
2090 FOR C =-1 TO 1 STEP2:IFUA+C<1ORUA+C>8 OR
     VA+GA<1ORVA+GA>8THEN2250
2100 IFS(UA+C,VA+GA)=GA OR S(UA+C,VA+GA)=2*GA
     THENQ=Q+1
2110 IFUA-C<1ORUA-C>8ORVA-GA<1ORVA-GA>8THEN 2250
2120 IFS(XA,YA)=2*GA THEN 2140
2130 GOTO2170
2140 IFS(UA+C,VA-C)=0ANDS(UA-C,VA+C)=
     0ANDS(UA-1,VA+C)=-2*GA THEN 2160
2150 GOTO2170
2160 IFS(UA+1,VA-C)=-2*GA THEN Q=Q+3
2170 IF(S(UA+C,VA+GA)=-GA OR S(UA+C,VA+GA)=-2*GA)
     THEN 2190
2180 GOTO 2200
2190 IF S(UA-C,VA-GA)=0 OR (UA-C=XA AND VA-GA=YA)THEN
     Q=Q-3
2200 IF S(UA+C,VA-GA)=-2*GAAND(S(UA-C,VA+GA)
     =0OR(UA-C=XANDVA+GA=YA))THENQ=Q-3
2210 IF S(UA+C,VA+GA)=-2*GA AND (UA-C=XA AND VA-GA=YA)
     THENQ=Q-3
2220 IFUA+2*C<1ORUA+2*C>8 OR VA+2*GA<1OR
     VA+2*GA>8THEN 2250
2230 IFS(UA+C,VA+GA)=0AND S(UA+2*C,VA+2*GA)=0 AND
     S(UA,VA+2*GA)=-GATHENQ=Q+.5
2240 IFS(UA+C,VA+GA)=0ANDS(UA+2*C,VA+2*GA)=0AND
     S(UA,VA+2*GA)=-2*GATHENQ=Q+.5
2250 NEXT C
2260 IF S(XA,YA)=2*GA THENQ=Q+.2:GOTO 2380
2270 REM MAN ONLY
2280 IFVA=ED THENQ=Q+2
2290 IFCP=1THEN FC=-2:FORFC=-2TO2STEP4:GOSUB2470:NEXT
2300 IFYA=ED - GA*2 THEN Q=Q+.2
2310 IFYA=ED - GA THEN Q=Q+.3
2320 IF YA=ED - 7*GA THENQ=Q-2.2
2330 IFXA=1OR XA=8THEN2360
2340 IF XA+1>8OR XA-1<1 OR YA-GA<1 OR YA-GA>8
     THEN 2360
2350 IFS(XA+1,YA-GA)=2*GA OR S (XA-1,YA-GA)=-2*GA
     THENQ=Q+2
2360 IF UA=1 OR UA= 8 THENQ=Q+1:IFVA=ED THENQ=Q-1.2
2370 RETURN
2380 REM KING ONLY
2390 IF CP=1 THEN FORFB=-2TO2STEP4:
     FOR FC=-2TO2STEP4:GOSUB2470:NEXT:NEXT
2400 IFVA=5 AND(UA=3ORUA=4ORUA=5)THENQ=Q+.25
2410 IFVA=4 AND (UA=3ORUA=4ORUA=5)THENQ=Q+.25
2420 IFUA-1<1 OR UA+1>8 OR VA-GA<1OR VA-GA>8
     THEN 2440
2430 IFS(UA-1,VA-GA)=-GA AND S(UA+1,VA-GA)
     =-GA THENQ=Q+1
2440 IFUA=1 OR UA=8 THENQ=Q-.5
2450 IF VA=1 OR VA=8 THEN Q=Q-.5
2460 RETURN
2470 UC=UA+FB:VC=VA+FC
2480 IFUC<1ORUC>8 OR VC<1ORVC>8THEN RETURN
2490 IFS(UC,VC)=0AND S((UC+UA)/2,(VC+VA)/2)=-GA
     THEN Q=Q+10
2500 IF S(UC,VC)=0 AND S((UC+UA)/2,(VC+VA)/2)
     =-2*GA THEN Q=Q+11
2510 RETURN
2520 REM ENDINGS
2530 IF GA = 1 THEN RETURN
2540 IF P2<6 AND P1>P2 THEN 2610
2550 IFV=3 AND S(U,1)>0 THEN Q=Q+2
2560 IFS(X,Y)<>-2 THEN 2650
2570 IFU=3 AND S(1,V)>0 THENQ=Q+2
2580 IFU=6 AND S(8,V)>0 THEN Q=Q+2
2590 IFV=6 AND S(U,8)>0 THEN Q=Q+2
2600 GOTO 2650
2610 IF(U=7AND V=1)OR(U=8ANDV=2)OR(U=1ANDV=7)
     OR(U=2ANDV=8)THENQ=Q+1.5
2620 IF8-U>U-1 AND U-1<X-1 AND 8-V<8-Y
     THENQ=Q+.3:GOTO2650
2630 IF 8-U<X-1 AND V-1<Y-1 THENQ=Q+.3
2640 IFU=1 OR U=8 OR V=1 OR V=8 THEN Q=Q-.35
2650 IFS(X,Y) <> -1 THEN 2740
2660 FOR I= V TO 1 STEP -1
2670 IF S(U,I)>0 THEN 2740
2680 IF U=8 AND S(U-1,I)>0THEN 2740
2690 IF U+1 >8 THEN 2740
2700 IF U=1 AND S(U+1,I)>0 THEN 2740
2710 IF S(U-1,I)>0 OR S(U+1,I)>0 THEN 2740
2720 NEXT I
2730 Q = Q + 1
2740 RETURN
```



It's Here! 2 for 1 sale

Buy one of our computers at our usual discounted price and get the new ***Timex-Sinclair*** Computer ***Free.***

LNW Research Model 11 .... **$2499**
TRS-DOS & CP/M Cmpatible—Green Phosphor Monitor—Two 40 Trk. Drives—96K—4 Mhz. Speed—Hi Res & Color Graphics—RGB Interface—Fan—6 Month Warranty

Custom Radio Shack Model 111 .... **$1899**
—Dual 40 Trk. Drives—48K RAM—180 Day Warranty
Options: CP/M—64K RAM

Sanyo MBC-1000 .... **$1899**
"Affordable High Performance Computer"
40 Trk. Double Sided Disk Drive—64K—4Mhz Speed—CP/M—Basic Language—Detachable Keyboard

Other Drive Configurations Available

Software: MicroPro • Microsoft • Ashton-Tate • Sorcim • LifeBoat
Printers: Epson • Okidata • C. Itoh • Smith Corona • Comrex
Specialty Items: LNW Expansion Interface & Doublers Disk Drives • TRS-80 Mod III Drive Kits • Printer & Drive Cables

Timex-Sinclair **$89.95**
Atari 400, Atari 800 .... **$call**
Lobo Max 80 .... **$call**

Freedom Technology Int'l
CP/M Conversion Boards for TRS-80
Freedom Option ... $199 • Freedom Plus (adds 16K) ... $399

Visa, Mastercard, Personal checks accepted. This is a limited time offer.

MERIDIAN
119 N. 18th Street Phila., PA 19103
(215)-569-2420
CIRCLE 229 ON READER SERVICE CARD

Trademarks: TRS-DOS, TRS-80, Radio Shack-Tandy Corp., CP/M-Digital Research Corp.

7 Good reasons why you should subscribe to *Creative Computing.*

Creative Computing
Six Languages Which Are For You?
IBM Personal Computer

It's the Number One magazine of computer applications and software!

There's one place you can always be sure of learning more about microcomputer software and applications: *Creative Computing.*

Every month *Creative Computing* provides you with a continuing education on everything related to microcomputers and computer equipment. Useful articles, "how to" tutorials, exciting new applications, games and "no holds barred" reviews of the latest software and equipment make up a major part of *Creative Computing*'s editorial content.

We give you probing features on programming breakthroughs and important news. Plus in-depth articles on elementary, intermediate and advanced software and applications topics—to help you develop your knowledge and skills, save hundreds (perhaps thousands) of dollars in unneeded software, discover uses for your personal computer that you might never have considered. Articles that increase your overall "computer consciousness." Here's how:

1 *Creative Computing* gives you things to actually do with a computer.

Just owning a computer isn't enough. You've got to know what to do with it. That's why applications are our primary focus. Text editing, animation, graphics, business simulations, data base and file systems, music synthesis, control of household devices, communications, games—some of the applications and software you'll learn about in *Creative Computing.*

2 *Creative Computing* discusses business applications in simple, nontechnical language.

If you're a business person who needs to know about the latest developments in word processing and office applications, turn to *Creative Computing.* We clarify such business applications as investment analysis, futures evaluations, data base management, mailing list programs, text editing, word processing and simulations. And all the software available for business people.

3 *Creative Computing* helps you decide which computer equipment is best for you.

Our tough, no-nonsense equipment profiles arm you with the facts before you walk into a computer store. You'll know the right questions to ask and how to cut through the jargon and sales hype. We give you authoritative guidance in deciding what you need, what you don't need—and what's right for you and your pocketbook.

4 *Creative Computing* covers computer education in depth.

We started out as a computer education publication, and we're still committed to the educational community. We regularly carry articles on designing educational software, evaluating educational software, teaching concepts and terminology in computer education, text editing applications for literature and computer simulations in the classroom—plus a great deal more.

5 *Creative Computing* brings you hours of mind-expanding game entertainment.

We've got a soft spot for the computer game addict—and computer game software. We know you want to understand more about the new computer games flooding the market: which ones are easiest to learn? Require the most skill? Offer the most surprises? Give you the best graphics? Provide the most challenge? Contain a new twist? *Creative Computing* brings you the answers.

6 *Creative Computing* features the state of the art.

Columns on the most popular personal computers, a "software legal forum," letters to the editor. Reviews of books, games, organizations, dealers and events. Fascinating interviews with leading innovators, equipment designers, program developers and game inventors—men and women who'll give you a real glimpse of the future!

7 Our price is right.

By subscribing to *Creative Computing* now, you can save as much as 33% off the full subscription price. To learn elsewhere what you'll learn from *Creative Computing*, you might spend hundreds of dollars in course fees and books. Then you'd have to winnow out what you could use from all that you'd learned. But *Creative Computing* does that for you, so you'll have time to enjoy your own computing interests. And that saving of time makes this offer very inexpensive indeed.

Join over 150,000 *Creative Computing* readers by subscribing today! Just use the coupon at right.

SAVE UP TO 33%!

Creative Computing · P.O. Box 5214 · Boulder, Colorado 80322

YES! Send me *Creative Computing* for:

☐ One year (12 issues) for $19.97—I save 20%!
☐ Two years (24 issues) for $36.97—I save 26%!
☐ Three years (36 issues) for $49.97—I save 33%!

Savings based on full one-year subscription price of $24.97.

Check one: ☐ Payment enclosed. ☐ Bill me later.

Mr. / Mrs. / Ms.____________________
(please print full name)

8H211

Address____________________Apt.______

City____________________

State____________Zip____________

Offer valid in U.S. and possessions only. Please allow 30 to 60 days for delivery of first issue.

Standard Keyboard For The Atari 400

Robert Noskowicz

While shopping for a home computer, I did quite a bit of research, eventually narrowing my decision to a choice between the Atari 400 and 800. With a little more investigation I found that the only differences between the two are the three most obvious: 1) easy access to additional memory, 2) the two ROM slots and 3) the keyboard. The processors—operating systems and ROM—are exactly alike. Since Atari still has not used the second ROM slot, and the 400 can be fairly easily upgraded to 48K, the only appreciable difference is the keyboard. The 400 has a flat membrane keyboard compared to the standard typewriter keyboard on the 800. I didn't feel at that point that the differences warranted the approximate $400 additional cost for the 800, so I purchased the 400.

Robert Noskowicz, 44 York St., Old Bridge, NJ 08857.

After 6 months of use, I was extremely happy with my computer except for the keyboard. I found that the flat keyboard impairs the ability to enter data quickly as well as causing discomfort when entering a substantial amount of information into the system. I went from "I'll get used to it" to "It's not all that bad" to total exasperation.

What I will explain here is what I did to cure my problem: I added a standard keyboard to my machine.

First I opened my computer to determine how the keyboard was interfaced. I had the Atari Technical User's Notes but they did not contain any schematics for the keyboard. After calling several home computer stores to see if they had any information on changing keyboards, with no luck, I called Atari's toll free number in California. If you have ever called Atari, you already know that (like most computer manufacturers) they do not like you to make changes in their hardware and provide very little technical help.

I realized that I would have to do everything myself. The one thing I did know was that the decoding of the keyboard is done in the processor. The keyboard, in the case of the Atari, is just a bunch of momentary ON switches, 61 to be exact. I sat down with my ohm meter, went from point to point, and drew the keyboard layout (Figure 1).

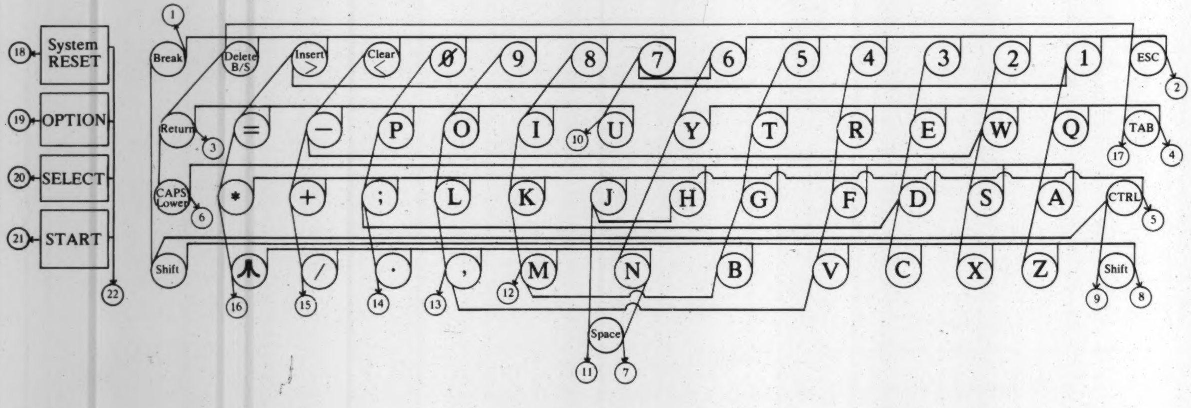


Figure 1. Ribbon cable on original keyboard is numbered 1-22. Keyboard is viewed from the back in above diagram.

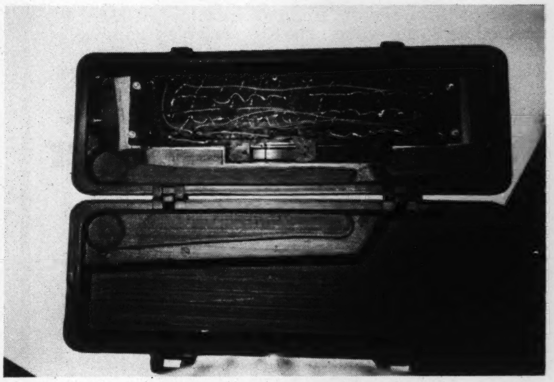


Photo 1.

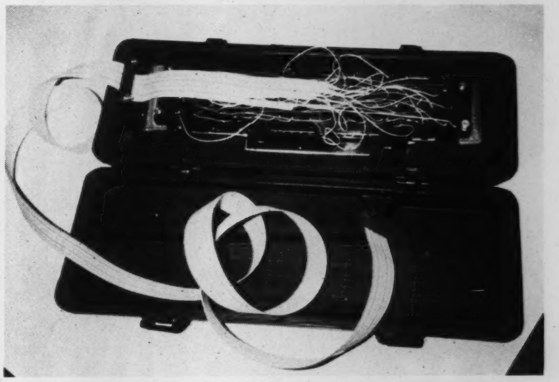


Photo 2.

The next step was to purchase the necessary parts. The keyboard that I bought from a firm in California has 62 keys and costs $35. It is called a bare keyboard because it is not mounted on a PC board. Initially I intended to mount the keyboard on the computer but my wife suggested that I use a cable and keep it separate.

This was an excellent idea since I keep the computer on a Parsons table in front of my TV and sitting on the couch slouching over it can be a real pain in the neck, literally. Now I can keep the keyboard on my lap which I find extremely comfortable.

If you decide to go this route, you will need about seven feet of ribbon cable which costs approximately 60 cents per foot. I used 25-conductor cable because I wanted to have a connector between the computer and the new keyboard so that I would be able to disconnect it. Otherwise it would only require 22-conductor.

The connector is a 25-pin RS-232 type made for ribbon cable. It costs about $14 per set. If you want a case for the keyboard, you can purchase one for about $56. If you are like me and wish to save some money, go to your local hardware store and buy a small Permanex tool box which costs about $6 and cut it to shape.

Some of the keys on the new keyboard are in different locations. You can leave them as is or move them about, providing you follow the wiring layout in Figure 1.

One thing I had to do on the new keyboard was to keep the Cap/Lock key from locking, since on the Atari the Cap Key does not lock.

The first step was to wire up the new keyboard (Photos 1 and 2). Since I had one extra key, I used two keys in series for system reset. This prevents me from accidentally resetting my computer.

Next I soldered the new ribbon cable to the back of the Atari keyboard where the original cable is soldered, leaving the original in place (Photo 3). You will notice that I routed the cable to one side and mounted the male connector into the side of the casing. I then assembled the computer and tested the Atari keyboard to make sure that nothing shorted. So far, everything tested OK. I then plugged my new keyboard in and tested it. It worked fine.

The keys on the new keyboard are parallel to the Atari, so either keyboard can be used. ☐

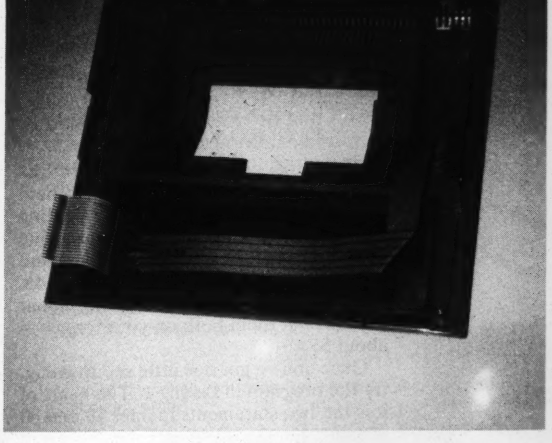


Photo 3.

Photo 4.

How to Build an Analog to Digital Interface for Fun and Learning

Make Your Computer Into a Love Potency Meter

David H. Ahl

This simple project allows you to make your computer into a love potency meter or nervousness gauge. However, beyond the fun value, this project will show you how a digital computer can interface with an analog world.

The project makes use of the fact that the continuously variable joysticks and potentiometers (paddle controls) for many computers are either 100K or 150K ohms. Since the resistance of human skin when good contact is made is also in this range, we can substitute a human being for a potentiometer—at least as far as resistance is concerned.

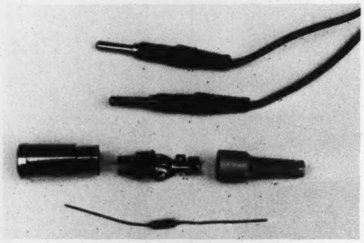
The circuit is trivial. We simply put a 100K or 150K ohm resistor between the +5 volt source (at the game I/O port) and the ground so the computer has the stability of a constant load. We then let our human being grasp two connectors, one hooked to +5 volts and the other to what normally would be the center tap of the potentiometer.

Voila! The computer reads a value corresponding to the resistance of the person. We can then write a program to make the computer appear to be a love potency meter, nervousness gauge, or whatever. On a more serious note, we could also use it as a moisture gauge or, with an appropriate sensor, a light meter, density gauge, or infrared spectrometer.

TRS-80 Color Computer

For the TRS-80 Color Computer, you'll need a 5-pin, 240° D.I.N. male plug, a 100K ohm resistor, two lengths of wire (lamp cord does nicely) and two thingies that your human can grasp. I used a pair of banana plugs, but practically anything will do, including the bare wire ends. For reasons known only to Radio Shack, they don't sell the D.I.N. plug so you'll have to get it elsewhere. Be sure to get a 240° one, the more common 180° one won't fit.

Take apart the plug and solder the resistor right to the connectors. Figure 1 shows the back (or solder) side. Solder on three or four foot wires to your human connectors.



Parts for Color Computer sensor: banana plugs, disassembled D.I.N. plug, resistor.

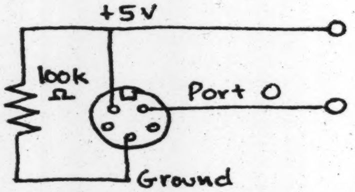


Figure 1. Circuit for TRS-80 Color Computer.

Plug the D.I.N. plug into the right joystick socket and run the following program:

```
5 CLS
10 PRINT@0 JOYSTK(0)
20 GOTO 10
```

When the connectors are apart, the screen should read 0. Touching them together should register 63. Try holding one in each hand; you should get a value between 5 and 20. Wet your fingers and hold them; now you should see 30 to 45. Hold them in a moistened palm—about 50 now. Put them both on your tongue—about 55.

Once you've got this little set up going, try the program in Listing 1. The heart of it is the two statements in lines 70 and 80 which take the resistance reading and force it into one of six outcomes.

Reliable Business Software

DATASMITH software requires no previous computer experience, so it can be used effectively by your present office staff. The menu-driven systems feature extensive error detection and correction facilities, so they are "friendly" to the user.

- GENERAL LEDGER. Everything you need to keep the books. Features easy-to-use data entry and error correction, trial balance, fast post, and a variety of comprehensive reports. Automatic error detection keeps the books in balance. Writes checks and makes journal entries in one operation.
- PAYROLL. A very flexible system that adapts to a wide variety of needs. Features Federal, state, and local tax calculations, EI credit, and special pay and deduction amounts. Prints all necessary reports, paychecks, and W-2 forms.
- DATA MANAGER. A powerful generalized data management system that lets you define, enter, update, sort, select, and print reports from a database of your own design. Applicable to almost any job where records must be kept, this system can replace literally hundreds of programs.

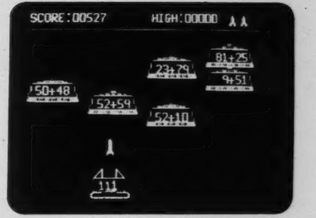
Put your computer to work with these sophisticated systems now. Programs are available for 48K or larger two-disk systems in your choice of code for Microsoft BASIC-80' under CP/M IBM Personal Computer BASIC, or Micropolis BASIC.

DATASMITH

Box 8036, Shawnee Mission, KS 66208, (913) 381-9118

CIRCLE 174 ON READER SERVICE CARD

MATH INVADERS!!!



The excitement of an ARCADE GAME! The challenge of LEARNING!

As alien spaceships attack you with math problems, you maneuver your spaceship under them, enter the answer and shoot a rocket. The correct answer destroys the problem. Choose addition, subtraction, multiplication, division, or mixed operations. Problems are randomly generated. The computer keeps score so you can play against others or alone. Features animated high resolution graphics, sound, color, and imaginative programming.*

Specify Computer:

APPLE II	TRS-80	PET
(Disk Only)	(Disk or Cassette)	(Disk or Cassette)

We must receive your order by Dec. 8 for Xmas Delivery

Send check of money order, charge to VISA or MASTERCARD. Include card # and exp. date.

$21.95 pre-paid

***graphics differ according to computer**

Order toll free

1-800-645-3739

EDUCATIONAL ACTIVITIES

Dept. C • Box 87 • Baldwin, NY 11510

Apple, TRS-80 & PET are all registered trademarks.

CIRCLE 188 ON READER SERVICE CARD

Super Sale!

40% Off On Ohio Scientific Superboard II A Complete Computer System On A Board

Includes full-size 53-key keyboard, video and audio cassette interfaces; SWAP, Modem, sampler cassettes; manual; 8K BASIC-in-ROM, with 8K RAM. Requires 5-V/3 amp regulated DC power supply. 30-day limited warranty. Supply is limited. ONLY $200.00

Plus Sensational Limited-Time Savings On Ohio Scientific C1P Series personal computers, Superboard and C1P accessories, spare replacement parts, printers, monitors, integrated circuits, and other computer-related components.

To Order

Call us directly or return order coupon with your check, money order, or Mastercard or Visa Account Number. Orders will normally be shipped within 48 hours after receipt. $100.00 minimum order.

FREE
Sampler Cassettes with each Superboard II and C1P series order!

Taxi (Game), Electronic Equations, Loan Finance, Straight and Constant Depreciation, Uneven Cash Flows

Tiger Tank, Flip Flop, (Logic Game), Hectic, Black Jack, Master Mind

Cleveland Consumer Computers & Components
1333 S. Chillicothe Road, Aurora, OH 44202
TO ORDER: CALL 1-800-321-5805 TOLL FREE
(Ohio Residents Call 216-562-4136)

☐ SUPERBOARD II, $200.00

☐ Send Detailed Catalog/Order Form

Name ______________________________

Address ______________________________

City ______________ State________ Zip________

Payment by enclosed check or money order or charge to:

☐ MasterCard ☐ VISA

Account #______________ Expiration Date ______________

Total Amount Charged or Enclosed $__________

Ohio Residents Add 5.5% Sales Tax. All Orders Will Be Shipped Insured By UPS Unless Requested Otherwise.

CIRCLE 226 ON READER SERVICE CARD

Love Meter, continued...

Apple II Computer

The device for the Apple II is built exactly the same way as the one for the Color Computer except that it uses 16-pin DIP plug (or header) and a 150K ohm resistor.

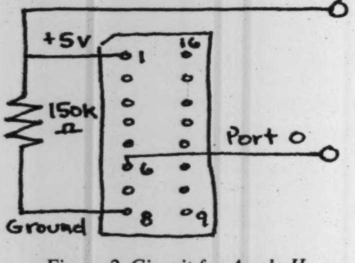


Figure 2. Circuit for Apple II.

Follow the schematic diagram in Figure 2. This shows the top (or solder) side the DIP plug. Note that the notch is by Pin 1. Be careful when soldering to the DIP plug; the plastic has a nasty habit of melting. Solder the resistor and 4-foot wires right to the plug.

Plug the finished device into the game I/O port (watch the alignment of the notch) and run the following program:

```
5 HOME
10 PRINT PDL (0)
20 FOR I = 1 TO 100: NEXT I
30 GOTO 5
```

When the connectors are apart, the screen should read 0. Putting them together should produce 255. Touching them in different ways as we suggested above should produce values in between.

Apple owners will have to make just three changes to the program in Listing 1. They are:

```
20 HOME
70 J = INT (PDL(0)/40)+1
1035 HOME
```

Atari 400 and 800

Although the Atari uses a one megohm potentiometer, no load resistor is needed at all, just two leads. The difficult thing may be finding one of those elusive DB-9 plugs of the type on the joysticks. Your best bet is an Atari VCS Service center or an old Atari joystick. You'll also need two wires and human connectors.

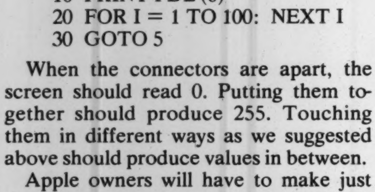


Figure 3. Circuit for Atari 400 and 800.

Solder the wires to the plug as indicated in Figure 3, plug into the left port and run the following program:

```
5 PRINT "}"
10 PRINT PADDLE (0)
20 FOR I = 1 TO 100: NEXT I
30 GOTO 5
```

Only one line in the love potency meter program need be changed:

```
70 J = 8-((PADDLE(0))/32)
```

The length of the leads and type of human connectors could necessitate adjustment of the last value (32) in Line 70.

Other Computers

The device described above may also be constructed for the IBM Personal Computer, VIC-20 and any other computer that accepts input from a continuously variable source. Simply follow the general directions above but substitute the correct input connector for your computer.

Other Control Devices

Any device which produces two or more resistance values can be "read" by the computer game port input. One with which you can have fun experimenting is an infrared photo transistor or photo resistive photo cell. Several are available for about $1.00 to $2.00. *Do not* hook up a silicon solar cell which generates a current; this can play havoc with your computer. Rather, look for a photo resistive cadmium sulfide photo cell or a resistive infrared photo transistor (a PFT-100, for example).

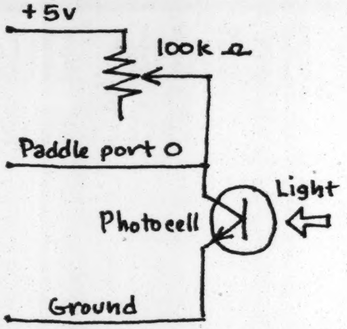


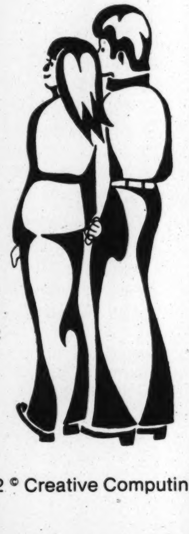
Figure 4. Control circuit to measure light intensity with a photo cell.

The resistance of such a device generally varies from something very low (about 250 ohms) when light is shining on it to a high resistance (12K ohms or more) when no light is present.

Use the circuit shown in Figure 4 to measure the light from the photo cell. Use a potentiometer setting to give the widest range of input values from various intensity light sources. Experiment! Have fun! □

```
10 REMARKABLE PROGRAM BY DAVID AHL
20 CLS
30 PRINT"GRAB THE TEST PROBE."
40 PRINT:PRINT"NOW SQUEEZE HARD!"
50 FOR I=1 TO 1200:NEXT I
60 PRINT:PRINT:PRINT
70 J=INT(JOYSTK(0)/10)+1
80 ON J GOTO 100,150,200,250,300,350,350
100 PRINT"MY GOSH!  YOUR HANDS ARE"
110 PRINT"LIKE A CACTUS.":GOTO 1000
150 PRINT"I'VE SHAKEN HANDS WITH A"
160 PRINT"LIMP FISH BEFORE, BUT...."
170 GOTO 1000
200 PRINT"LUKEWARM....BUT YOU'VE GOT"
210 PRINT"REAL POTENTIAL":GOTO 1000
250 PRINT"UMMMMM."
260 PRINT"NOT BAD, NOT BAD AT ALL!"
270 GOTO 1000
300 PRINT"OH MY GOODNESS!  MY CIRCUITS"
310 PRINT"ARE GOING TO OVERLOAD IN"
320 PRINT"ANOTHER NANOSECOND!!"
330 GOTO 1000
350 PRINT"I DON'T BELIEVE IT!  ARE"
360 PRINT"YOU REALLY A HUMAN?  I'VE"
370 PRINT"ONLY GOTTEN THIS KIND OF"
380 PRINT"TOUCH FROM ANOTHER COMPUTER"
390 PRINT"BEFORE.  OGLE, OGLE!"
1000 FOR I=1 TO 1500:NEXT I:PRINT:PRINT
1010 PRINT"IS THERE ANOTHER VICTIM IN"
1020 PRINT"THE HOUSE (Y OR N)";:INPUT A$
1030 IF A$="Y" THEN 20
1035 CLS
1040 PRINT"OH WELL, I GUESS NO ONE"
1050 PRINT"LOVES ME ANYMORE."
1060 PRINT:PRINT:PRINT:END
```

Listing 1.



PERSONAL FINANCE For the ATARI* 800

The Scitor® Personal Finance and Record Keeping package provides your home with a sophisticated yet simple automated records system. You can easily organize and keep track of expenses, checks, credit cards, energy utilization, jogging logs, diet and fitness programs, and other personal records. Reports, high resolution graphs, and color bar charts can be generated from the records providing you with insight into expenses, budgets, and progress versus goals. A General Ledger capability is provided allowing use of this package by a small business. In addition, ledger data may be interchanged with VISICALC.**

DEALER INQUIRIES WELCOME

*TRADEMARK OF ATARI INC.

**TRADEMARK OF VISICORP

SCITOR®

710 LAKEWAY SUITE 290
SUNNYVALE, CA 94086
(408) 730-0400

CIRCLE 358 ON READER SERVICE CARD

"Your Business Computer Headquarters"

Compare the Victor 9000 Desktop Business Computer

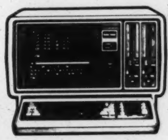
The Victor 9000 Desktop Business Computer gives you the kind of memory, storage capacity and software that business applications demand. Just compare the Victor 9000 with the competition, and we're confident you'll pick Victor.

VICTOR®
Serving American business for 65 years.
VICTOR BUSINESS PRODUCTS

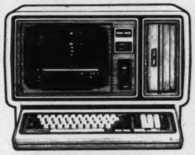
—— Call For Quotes!! ——

Compare and you'll pick Victor.

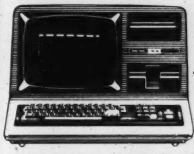
TRS-80™ Business Computers



128K Model 16
- 1 Drive $4134
- 2 Drive $4795



64K Model II
$2974



Model III
48K, 2 Drive $1950
48K, 1 Drive $1571
16K $839

Call For QUOTES On Complete Product Line

VISA MasterCard AMERICAN EXPRESS

800-351-1580

In Texas Call Collect: 915-283-2920

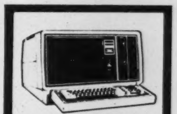
Van Horn Office Supply

701 W. Broadway
P.O. Box 1060
Van Horn, Texas 79855

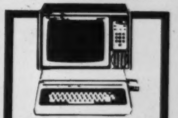
CIRCLE 359 ON READER SERVICE CARD

From Computer Plus to YOU...

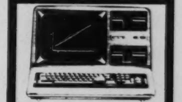
PLUS *after* PLUS *after* PLUS



Model 16 128K
1 Drive $4199
2 Drive $4799



Color Computer 16K $249
w/16K Ext. Basic $335
w/32K Ext. Basic $449



Model III 16K $799
Model III 48K
2 Disk & RS232 c $1899

Okidata 80 $325
Okidata 82A $425
Okidata 84 $1029

Color Computer Disk Drive
Drive 0 $470 Drive 1 $315

Smith Corona TPI
Daisy Wheel $599

BUY DIRECT *Here are just a few of our fine offers... call TOLL FREE for full information.*

COMPUTERS	
Model II 64K	$2999
Model III 4K LEV I	599
MODEL III 16K	799
MODEL III 32K	856.50
*MODEL III 32K	831.50
MODEL III 48K	914
*MODEL III 48K	864
Model III 48K 2 Disk & RS232 c	1899
Color Computer 16K	249
Color Computer 16K w/extended basic	335
Color Computer 32K w/extended basic	449
‡Color Computer 32K-64K w/extended basic	510
Pocket Computer 2	230
Model 16 1DR 128K	4199
Model 16 2DR 128K	4799
DT-1 Data Terminal	599
PT-210 Portable Terminal	779

MODEMS	
Lynx Direct Connect MI/MIII	235
Hayes Smart Modem II	235
R.S. Acoustic Coupler AC-3	134
R.S. Modem I D.C.	130
R.S. Modem II D.C.	210

PRINTERS	
Daisy Wheel II	1715
DWP-410	1335
Smith Corona TPI Daisy Wheel	599
Epson MX80	499
Epson MX80 FT	549
Epson MX100	735
CGP-115	199
DMP-100	315
DMP-200	599
DMP-400	1029
DMP-500	1569
Microline 80	325
Microline 82A	425
Microline 83A	679
Microline 84 Parallel	1029
P. C. Plotter Printer	199

DISK DRIVES	
R.S. Model III 1ST-Drive	679
Tandon 40 Track MI	289
Color Computer Drive 1	315
Color Computer Drive 0	470
Primary Hard Disk MII	3999
Primary Hard Disk MIII	1999

ETC.	
CCR-81 recorder	52
C. C Joysticks	22
16K RAM N.E.C. 200 N.S. chips	25
64K Ram Chips	75
Color Computer Flex D.O.S.	99
Brand Name Software • Send for listing.	
R.S. Software 10% off list	

*Computer Plus New Equipment with NEC RAM installed. 180 Day Computer Plus Warranty

‡Color Computer 64K requires Disk 0 and Flex D.O.S.

TOLL FREE 1-800-343-8124

We have the lowest possible Fully Warranteed Prices AND a full complement of Radio Shack Software.

computer plus

P.O. Box 926
480 King Street
Littleton, MA 01460
617-486-3193

Write for your free catalog

Prices subject to change without notice.
Not responsible for typographical errors.
TRS-80 is a registered trademark of Tandy Corp.

CIRCLE 150 ON READER SERVICE CARD

COMPUTERS

PORTABLE COMPUTER WITH 8" CRT

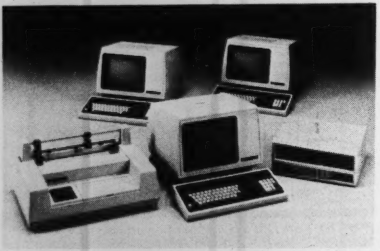
Telcon Industries announces a 64K CP/M emulating computer. The Future Two includes a pair of 160K disk drives and a 24 x 80 text display. Serial and parallel ports complete the package. The unit weighs 22 pounds and measures 17" x 9" x 17".

A version with twice as much disk capacity is available at a price premium of $200. A 6-megabyte winchester-based version costs $3995.

Telcon, 1401 NW 69th St., Ft. Lauderdale, FL 33309.

CIRCLE 378 ON READER SERVICE CARD

WINCHESTER-BASED MULTIUSER COMPUTER



Texas Instruments announces the System 300 Series of computers designed for small businesses. The basic model, System 340, contains the TMS99000 processor, 128K RAM, 5Mb fixed disk, and 600K of floppy disk. The top of the line System 372 includes the same processor and RAM plus a 43Mb fixed disk and a 14.5Mb tape drive. Several intermediate models are also available. On any model, RAM can be expanded to 512K. Printers and other peripherals can be added. The systems support up to three users.

Texas Instruments, P.O. Box 2909, M/S 2216, Austin, TX 78769.

CIRCLE 379 ON READER SERVICE CARD

DESKTOP COMPUTER

The Kontact executive workstation from Mitel incorporates a 12" display, 5.25" 500K disk drive, modem, and a sleek, 94-key keyboard.

The built-in phone provides: autodial, display-based dialing, conference calls, and hold calls. The system can log the time spent on each call.

The electronic mail section can handle simulated in and out boxes, scheduled mailing, multiple recipient and group mailing, automatic reply, forwarding, and password protection.

The time management section of Kontact simulates a desk calendar on the screen. The user can map out an agenda, set alarms, and edit the week's schedule. $4000.

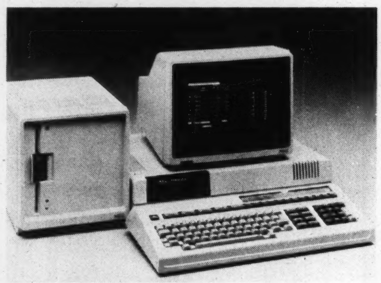
Mitel Corporation, Office Products Division, 302 Legget Dr., Kanata, Ontario, Canada K2K 1Y6.

CIRCLE 380 ON READER SERVICE CARD

ASTRA 200 MINICOMPUTER

Astra 200, a low end addition to the Astra series of business computers, is available from NEC Information Systems, Inc. The computer system is based on a 16-bit NEC microprocessor. Astra 200 is upward compatible with the larger multiterminal systems in the Astra line.

The system includes a processor, 256K of internal memory, a 2000-character 12" monochrome display, two 8" double sided, dual density diskette drives with 2 million bytes of formatted storage capacity, and NEC's ITOS operating system. The system supports ANSI Cobol, Fortran, and Basic programming languages. Internal memory and disk storage can be expanded. $4500.



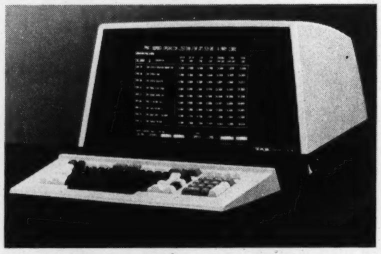
NEC Information Systems, 5 Militia Dr., Lexington, MA 02173.

CIRCLE 381 ON READER SERVICE CARD

NEW FAMILY OF OFFICE COMPUTERS

The Electronic Office Products Division of Tab Products Co. has announced the Tab System 800 and System 1600 family of 8 bit and 16 bit single and multiple user desktop office computers. Using the Tab 132/15 terminal, with its 15" screen and 132 column display, the computers are designed to be highly flexible and upwardly expandable to meet the needs of professional business users.

The System 830 is a single user system with one 8 bit processor and 64K of memory. It has a 5 1/4", 5 Mb hard disk for files and a 630K, 8" floppy disk for data input/output and backup. Base price is $7500, plus $150 for the CP/M operating system.



The System 1630 is a single user system with a 16 bit processor and 128K memory. It has a 5 1/4", 5Mb hard disk for files and a 630K, 8" floppy disk. Base price for the System 1630 is $7785, plus $250 for the CP/M operating system.

The System 1650 is a multiple user, 16 bit system with 128K of memory organized on a shared logic basis. It has hard and floppy disk capabilities similar to the models 830 and 1630. The 1650, however, can support up to six workstations, each capable of accessing hard disk, floppy disk, and system printer.

Price for a basic System 1650 with two workstations is $9800, plus $650 for the MP/M-86 operating system.

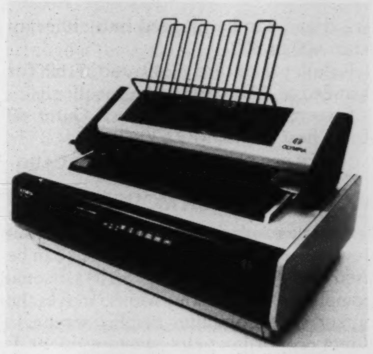
Electronic Office Products, 1451 California Ave., Palo Alto, CA 94304.

CIRCLE 382 ON READER SERVICE CARD

OLYMPIA HANDHELD AND PRINTER

Olympia USA Inc. has introduced a portable computer and a new printer. The Olympia Portable Computer is based on a 6502 microprocessor, with a 65-character keyboard, a liquid crystal display panel and an internal battery pack. It weighs 21 ounces, and supports 52K bytes of RAM, plus 64K of ROM.

By using the optional acoustic modem or RS-232C interface, an Olympia Portable Computer can be connected to mainframe computers, minicomputers or other personal computers. It comes standard with a 4K programmable memory, a 10-digit calculator, a clock/controller, and a file system.



The Olympia ESW 3000 Printer was developed for the midrange letter quality printer market, and extends Olympia's current line of lower speed printers.

The ESW 3000 incorporates an Olympia print wheel with 100 characters. Standard lettering in many typestyles, proportional spacing, four pitches, bidirectional printing and print wheel cassette insertion are also included. Print speed is 35 characters per second.

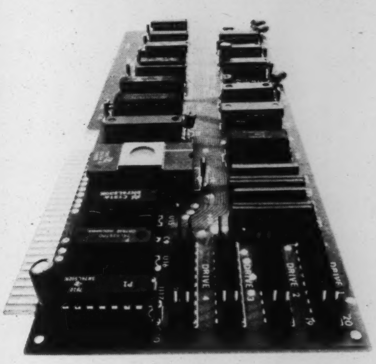
Olympia USA Inc., Box 22, Somerville, NJ 08876.

CIRCLE 383 ON READER SERVICE CARD

TERMINALS & I/O

DISK CONTROLLER CARD

Rana Systems has announced the Elite Controller Card with four drive capability for any combination of Rana Systems Elite Minifloppy Disk Drives or Apple II disk drives. It automatically boots 13 and 16 sector diskettes, and is compatible with DOS 3.3, Pascal 1.1 and CP/M 2.20B. Other features include: improved data separation, LED indicators of operating modes and diagnostic aids, power



The Sensible Speller...

what a spelling verification program should be!

THE SENSIBLE SPELLER is the first COMPLETE spelling verification program for the Apple Computer. NO other spelling program includes as many options, or has a dictionary (on diskette) as large as ours, and includes a well known dictionary, too. THE SENSIBLE SPELLER now features the complete CONCISE EDITION of the RANDOM HOUSE® DICTIONARY. If you question the definition, pronunciation, or spelling of any word, you can simply look it up in the supplied hardcover dictionary.

Five versions of THE SENSIBLE SPELLER are available. There is no need to MUFFIN or transfer your files from one operating system to another.

Works with almost every word processor, editor, or program that generates standard DOS 3.3 TEXT or BINARY files	DOS 3.3
Works with Word Handler II	WORD HANDLER
Works with all versions of Super Text	SUPER TEXT
Works with WordStar, ED, Type Master, and any other word processor that does not compact text	CP/M
Works with the Pascal Editor and Prose.	PASCAL

THE SENSIBLE SPELLER package includes:

- an easy to read instruction manual
- two copies of THE SENSIBLE SPELLER program
- a main dictionary diskette, containing 40,000 of the most commonly used English language words (there is room to add approximately 10,000 of your own words)
- a supplementary dictionary diskette, containing the remaining 40,000 words in the RANDOM HOUSE DICTIONARY
- the hard cover RANDOM HOUSE DICTIONARY, CONCISE EDITION

THE SENSIBLE SPELLER requires an Apple II/ Apple II + equipped with 48K, DOS 3.3 and 1 or 2 disk drives. Two disk drives are required to delete or add words to the dictionary. The price is only $125.00

Sensible Software

6619 Perham Drive,
West Bloomfield, Michigan 48033
(313) 399-8877

Visa and Mastercard Welcome
Add $1.25 postage and handling per program.

APPLE is a registered trademark of APPLE Computer Company • CP/M is a registered trademark of Digital Research Corp.
SUPER TEXT is a registered trademark of Muse Software • APPLE PASCAL is a registered trademark of U.C.S.C.
RANDOM HOUSE and the House design are registered trademarks of Random House, Inc. Copyright 1982 Random House, Inc.
WORD HANDLER is a registered trademark of Silicon Valley Systems, Inc.

CIRCLE 308 ON READER SERVICE CARD

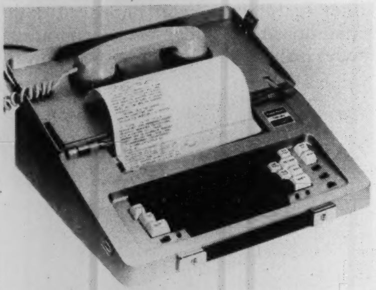
reduction capabilities and an improved interface buffering design.

Priced at $135., the Elite Controller Card comes with a user manual and an Elite Diskette Enhancer.

Rana Systems, 20620 South Leapwood Ave., Carson CA 90746.

CIRCLE 384 ON READER SERVICE CARD

TRS-80 PT-210 PORTABLE DATA TERMINAL



Radio Shack has introduced the TRS-80 PT-210 Portable Data Terminal. It includes a full typewriter keyboard, a thermal printer, and a 100/300 baud (Bell 103A compatible) acoustic telephone coupler. It generates 99 codes, including 67 printable characters, 32 terminal control characters, and a switch-selectable numerical keypad. $995.

An optional add-on RS232-C Interface Module featuring plug-in installation is available for $69.95.

Tandy Corporation, 180 One Tandy Center, Fort Worth, TX 76102.

PRINTACOLOR PERSONAL COLOR GRAPHICS

A color graphic ink-jet printer designed to interface with the IBM PC, Apple II, or Apple III computer has been introduced by Printacolor. The PG-1000 enables the personal computer to translate computer graphics into color hard copy. It can produce images containing over 125 shades of color, with the production time of an 8 1/2 by 11 inch image typically under two minutes.

Designed to be open-ended, the PG-100 can be upgraded through software. The ink-jet printer is packaged with an interface card, software for the IBM PC, Apple II or Apple III, 500 sheets of paper, and a disposable ink cartridge.

Printacolor Corporation, 5965 Peachtree Corners East, Norcross, GA 30071.

CIRCLE 385 ON READER SERVICE CARD

ADD-ON KEYBOARD FOR ATARI

The Sidewriter full-stroke keyboard looks and works like an Atari 800 keyboard and can be plugged into either an Atari 400 or 800.

Retail prices are $249 and $169 for installed and kit versions, respectively.

Screensonics, Inc., 14416 S. Outer 40 Rd., Chesterfield, MO 63017.

CIRCLE 386 ON READER SERVICE CARD

MICROCOMPUTER MOUSE

A high resolution digital Mouse input device from Random Access, Inc., can be used with Apple, IBM, and S-100 personal computers. The Hawley Mouse moves the cursor on a computer display screen in direct proportion to its own movement. It can be used for transferring drawings to the computer, or for cursor placement. It allows direct selection and activation of functions in menu-driven software.

The unit is composed of a decoder and a host interface card. The Mouse plugs into decoder logic housed in a small cabinet located externally to the host system.

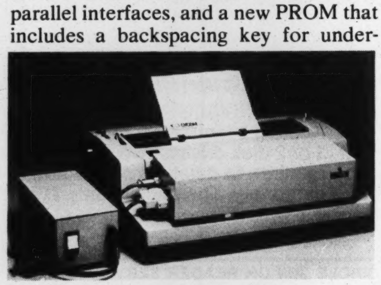
Random Access, Inc., 246 Highland Rd., Pittsburgh, PA 15235.

CIRCLE 387 ON READER SERVICE CARD

TYPEWRITER TO PRINTER CONVERSION

Hollander Office Products has announced hardware enhancements and a price reduction to the Tyrop, an adapter designed to turn an electric typewriter into a low-cost word processing printer when interfaced with a microcomputer.

The Tyrop II has an external DIP switch to allow conversion from serial to parallel interfaces, and a new PROM that includes a backspacing key for underscoring text. The adapter is compatible with the IBM Selectric I, II, III or other equivalent electric typewriters. The printing speed for typewriters using the Tyrop II is 600 characters per minute. $695.



Hollander Office Products, 41 Duesenberg Dr., Thousand Oaks, CA 91362.

CIRCLE 388 ON READER SERVICE CARD

SMART VIDEO TERMINAL WITH AUXILARY PORT

Hazeltine Corporation announces a terminal that emulates a Televideo 950 with a green phosphor CRT. Unusual features of the device include a printer buffer, and a bidirectional auxilary RS-232 port. $895.

Hazeltine Corporation, Commack, NY 11725.

CIRCLE 389 ON READER SERVICE CARD

EXPANSION MODULES FOR ASTROCADE

Alternative Engineering offers the Viper-1 expansion kit for the Astrocade (formerly Bally) home computer.

The Viper-1 includes 16K RAM, power supply, keyboard interface, switched AC outlet, and extended Basic. Also available is the Viper system keyboard which is a 62-key full-stroke model.

Alternative Engineering Corp., P.O. Box 128, Gardiner, ME 04345.

CIRCLE 390 ON READER SERVICE CARD

GRAPHICS CARD FOR IBM PC

Frederick Electronics announces an alternative to the IBM color graphics card. The Colorplus can display four colors in the 640 x 200 pixel mode. In the 320 x 200 mode, the new board can display 16 colors. These capabilties, which correspond to the one-color and four-color modes of the standard board, also apply to 80-column and 40-column text modes.

Colorplus also contains a parallel printer port and is said to be completely compatible with existing IBM color applications. $995.

Plantronics / Frederick Electronics Corp., PC+ Products, 7630 Hayward Rd., P.O. Box 502, Frederick, MD 21701.

CIRCLE 391 ON READER SERVICE CARD

GREEN SCREEN

The BM-12EN monitor is the latest addition to the BMC line from Leading Edge Products. It is a high resolution, non-glare, green screen 12" model.

Leading Edge Products, 225 Turnpike St., Canton, MA 02021.

CIRCLE 392 ON READER SERVICE CARD

MISCELLANEOUS

PC PEDESTAL

Curtis Manufacturing Company has introduced the P.C. Pedestal for the IBM Personal Computer. Scientifically designed, the P.C. Pedestal can be tilted or swiveled in any direction for optimum viewing angle and minimum glare. Increased air circulation is provided by cooling slots styled to match the system unit. In addition, a 3' extension cable set is available to allow for extra freedom in arranging the system components.

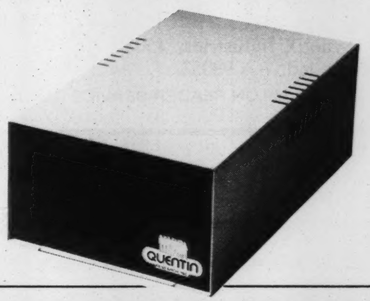
The P.C. Pedestal is $79.95; the extension cable set is $49.95. Curtis Manufacturing, One Curtis Rd., Winchester, NH 03470.

CIRCLE 393 ON READER SERVICE CARD

DISK SYSTEMS

NEW APPLE COMPATIBLE DRIVE

The Apple-Mate 5 1/4" floppy disk drive has been introduced by Quentin Research Inc. Apple-Mate is fully transparent with DOS 3.3 and 3.2.1, as well as Pascal and CP/M in full and half track operation.



Apple-Mate also features a diskette protection system, 40 track capability, redundant write protection, and automatic power-down. $335.

Quentin Research, 19355 Business Center Dr., Northridge, CA 91324.

CIRCLE 394 ON READER SERVICE CARD

EXPANDED TRS-80 DISK STORAGE

Expanded disk drive storage for TRS-80 computers with up to four megabytes of floppy disk storage is available from Interface, Inc.

For internal storage on the Model III, there are four drives available: a single-

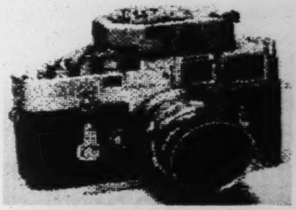
LET YOUR APPLE SEE THE WORLD!

The DS-65 Digisector® opens up a whole new world for your Apple II. Your computer can now be a part of the action, taking pictures to amuse your friends, watching your house while you're away, taking computer portraits . . . the applications abound! The DS-65 is a random access video digitizer. It converts a TV camera's output into digital information your computer can process. The DS-65 features:

- **High Resolution** — a 256 × 256 picture element scan
- **Precision** — 64 levels of grey scale
- **Versatility** — Accepts either NTSC or industrial video input
- **Economy** — A professional tool priced for the hobbyist

The DS-65 is an intelligent peripheral card with on-board software in 2708 EPROM. Check these software features:

- Full screen scans directly to Apple Hi-Res screen
- Easy random access digitizing by Basic programs
- Line-scan digitizing for reading charts or tracking objects
- Utility functions for clearing and copying the Hi-Res screen



HI-RES PICTURE USING THE DS-65 AND PICTURE SCANNER SOFTWARE

Use the DS-65 for precision security systems; computer portraiture; robotics; fast to slow scan conversion; moving target indicators; reading UPC codes, musical scores and paper tape and more! **GIVE YOUR APPLE THE GIFT OF SIGHT!** DS-65 Price: $349.95 / FSII Camera Price: $299.00 / Combination Price: $599.00

ADDITIONAL SOFTWARE FOR THE DS-65

—**Picture Scanner:** Provides a variety of different dithering algorithms for compressing the digitized image into the Hi-Res screen. Available on 13-sector disk. Price: $39.95

—**Superscan:** Enables you to enhance the DS-65's Hi-Res pictures with colors! Choose from 21 different colors and assign them to grey scale values, modify pictures, zoom, enhance contrast, etc. Print routines for the Anadex and Paper Tiger* are provided. Comes on a 13-sector disk. Written for The Micro Works by Magna Soft. Price: $79.95

—**Portrait System Software:** This program includes captions and a credit line, reverse printing for T-shirt application and the option to save portraits on disk. Specifically for use with a Malibu 165 printer. Call or write for more information.

*Paper Tiger is a trademark of Integral Data Systems, Inc.

MasterCharge/Visa Accepted

THE MICRO WORKS P.O. BOX 1110 DEL MAR, CA 92014 714-942-2400

CIRCLE 242 ON READER SERVICE CARD

sided drive with 40 tracks and 250K unformatted storage for $215; a single-sided drive with 80 tracks and 500K unformatted storage for $335; a double-sided drive with 40 tracks and 500K unformatted storage for $335; and a double-sided drive with 80 tracks and one Mb of unformatted storage for $435.

For external storage with the TRS-80 Models I and III, there are also four drives available; they are priced slightly higher.

Interface, Inc., 765-30 Alabama Ave., Unit 3, Canoga Park, CA 91304.

CIRCLE 395 ON READER SERVICE CARD

15Mb DISK FOR APPLE II, APPLE III, AND IBM

Davong Systems has announced a 15-megabyte version of their winchester disk drives for three different computers. At $2995, the new system sets a 5000 bytes per dollar ratio. The 15Mb drive joins a product line that also includes a 10Mb drive for $2495, and a 5Mb model for $1995.

Davong Systems, Inc., 1061 Terra Bella Ave., Mountain View, CA 94043.

CIRCLE 396 ON READER SERVICE CARD

MODEL III HARD DISK

J&M Systems Consultants have designed the JHD-III, a hard disk system for use with the TRS-80 Model III. It utilizes a 5 1/4" Winchester drive with either 5 or 10 Mb of storage. An LDOS driver is used, that allows the storage to be divided into individual logical units.

The system comes with controller, host adapter, hard disk drive, all cables, adapter software diskette, and an operator's manual. The price is $1895 for the 5 Mb system and $2095 for the 10 Mb system.

J&M Systems, Ltd., 137 Utah NE, Albuquerque, NM 87108.

CIRCLE 397 ON READER SERVICE CARD

MEMORY

64K RAM BOARD FOR ATARI

Mosaic Electronics introduces a 64K RAM board configured as 48K of fixed, contiguous RAM, and four mappable RAM banks which contain 4K each. Any one of the mappable banks can be addressed at a particular time. Since these banks do not overlap the address occupied by ROM cartridges, they are always available. $249.95.

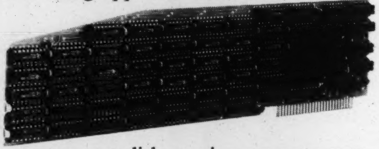
Mosaic Electronics, P.O. Box 708, Oregon City, OR 97045.

CIRCLE 398 ON READER SERVICE CARD

294K ON A CARD

Synetix Industries has announced a 294K byte memory card. The single board Solid State Disk Emulator works with the Apple II and Apple II+, and is available in 147K and 294K versions. The SSD plugs directly into any Apple I/O slot (1 through 7), and requires no external power.

The SSD is software compatible with DOS 3.3, Apple Pascal, and CP/M operating systems. Solid State Disks are for enhancing applications such as database management, disk copying, program compiling, graphics, and other memory-intensive tasks.



Synetix Industries, 15050 N.E. 95th, Redmond, WA 98052.

CIRCLE 399 ON READER SERVICE CARD

PERIPHERALS

TELEPHONE OPERATORS FOR APPLE II

Vynet Corporation offers two different telephone operators for the Apple II. Both the V100 and V101 can answer and dial touch-tone telephones. They can also interpret digits touched by a caller during a connection. In addition, the V100 can pronounce up to 1300 words.

The speech synthesizer in the V100 can make sounds said to be indistinguishable from those coming from a tape recorder. The standard V100 has a 300-word vocabulary. A 1300 word vocabulary is also available. A demonstration of the V100 can be reached at (800) 538-7002.

Vynet Corporation, 2405 Qume Dr., San Jose, CA 95131.

CIRCLE 400 ON READER SERVICE CARD

BOOKS AND BOOKLETS

WHOLE PET CATALOG

Over 500 reviews, along with the rest of Midnite Software Gazette's first seven issues, have been expanded into a 300-page compendium called the *Whole Pet Catalog*. The volume also contains material from Jim Butterfield and other members of the Toronto Pet User Group. $10.

Midnite Software Gazette, 635 Maple, Mt. Zion, IL 62549.

NEWSLETTERS

COMMODORE NEWSLETTER

The *Strictly Commodore Newsletter* is offered for owners of the Pet, Vic-20, CBM, and Superpet computers. This monthly publication contains at least five recreational and educational programs, plus feature stories, evaluations of hardware and software, articles with programming hints and tips, and information requested by readers.

Included in each newsletter is the latest news on what's happening in the Commodore industry. Subscription rate is $18 per year; sample copy $2.

Strictly Commodore, 47 Coachwood Pl. N.W., Calgary, Alberta, Canada T3H 1E1.

APPLICATIONS SOFTWARE

EDUCATIONAL

Four software packages for young people have been announced by Spinnaker Software. **A Christmas Sampler** brings a variety of holiday classics to life on the Apple, Atari, and IBM personal computers. Animated, hi-res graphic depictions of "A Christmas Story,""The Night Before Christmas," and a selection of Christmas carols are accompanied by screen texts for say and singalongs. **Face Maker** is a software toy which presents children with an interactive experience with computers. Different faces are designed from menus of eyes, ears, hair, etc. **Story Machine** teaches young computer users how to communicate with a computer using the keyboard, while developing the ability to write sentences and paragraphs. Using a list of words, the child constructs sentences which are then animated using color and sound. **Snooper Troops** is a series of interactive mysteries. Designed for ages 10 to adult, it stimulates organized thinking and the development and testing of hypotheses. Spinnaker Software, 26 Brighton St., Belmont, MA 02178.

Card reader-based educational software programs are available. The programs include those for test scoring, grading, and record-keeping tasks, daily and term attendance accounting, and computerized achievement monitoring. These software programs are to be used on the Apple II computer. HEI, Inc., Educational Systems Department, Victoria, MN 55386.
(612) 443-2500.

School Attendance System is a program that handles daily attendance accounting

BUY DIRECT
AT DISCOUNT PRICES
It's simple . . . .

TRS-80 COMPUTERS

NEW! Radio Shack TRS-80 Hard Drives Model I & III. . .from **$2087**

TRS-80 Color Computer

BUY DIRECT

PRICED FROM **$289**

TRS-80 Model II Computer

BUY DIRECT

PRICED FROM **$2899**

TRS-80 Model III Computer

BUY DIRECT

PRICED FROM **$599**

TRS-80 Model 16 Computer

BUY DIRECT

PRICED FROM **$4098**

Smith Corona TP-1 Daisy Wheel Printer

BUY DIRECT

PRICED FROM **$579**

FRANKLIN ACE 1000

★

ATARI

★

commodore

★

CALL FOR PRICES

ALL TRS-80'S ARE PURE RADIO SHACK EQUIPMENT

1-800-841-0860

Write for our Consumer Discount Price List

Micro Management Systems, Inc.
PARCEL DIVISION - DEPT NO. 3
2803 THOMASVILLE ROAD EAST
CAIRO, GEORGIA 31728
912-377-7120

BUYING DIRECT-MAIL QUESTIONS & ANSWERS

Why Purchase A Computer By Direct-Mail?
When buying a name-brand product - price is usually the main reason. The product is the same quality no matter where you buy.

Do I Really Save Money - If I Need Help?
When you buy by direct-mail the firm has geared its operation to sell at low prices. The savings will give you additional money to buy the extras you may need. Automakers don't teach you how to drive a car - we don't teach you how to use a computer. We do sell you a name-brand computer at low, low prices. Buy the computer and software you want, then you can learn to do-it-yourself and consult a professional only when additional help is required.

What About The Warranty On My Equipment?
If you purchase your computer equipment from a direct-mail firm - make sure the firm is an authorized dealer. Beware of firms selling modified or altered name-brand products as the manufacturer's warranty may no longer apply. Micro Management Systems sells only original factory-pure name-brand products covered by the manufacturer's warranty. Write us for a free copy of the warranty on any product we sell.

Which Direct-Mail Company Should I Buy From?
Micro Management Systems - Cairo, Georgia. We sell name-brand products. We offer low, low prices. We have a large inventory to assure prompt delivery. Our obligation to you . . . . .QUALITY PRODUCT - PRICE -HONESTY - RELIABLE.

Who Is Micro Management Systems?
Micro Management Systems has been selling computer equipment to the consumer on a direct-mail basis since 1978. Since that time thousands of consumers have purchased from us. We are HONEST and RELIABLE. If you plan to purchase by direct-mail you owe it to yourself to call us. We offer quality name-brand products, low prices, prompt delivery, toll free phones for quotes and orders, references, convenient ordering. All products we sell are factory-pure and backed by reliable name-brand manufacturers.

WE SELL AMERICA - Call us 1-800-841-0860
Write for our CONSUMER DISCOUNT PRICE LIST.

TRS-80 COMPUTERS

COLOR COMPUTER
Priced From. $289

MODEL III TRS-80
Priced From. $599

MODEL II TRS-80
Priced From. $2899

MODEL 16 TRS-80
Priced From. $4098

FRANKLIN
ACE COMPUTER
CALL FOR PRICE

ATARI

commodore

SCM SMITH-CORONA

1-800-841-0860

Micro Management Systems, Inc.
PARCEL DIVISION - DEPT NO. 3 A
2803 THOMASVILLE ROAD EAST
CAIRO, GEORGIA 31728
912-377-7120

CIRCLE 235 ON READER SERVICE CARD

and reporting for up to 2600 students. It provides for eight periods per day, absences, tardiness, excuses, and early dismissals. The system for the TRS-80 Model II and Model III requires 64K of memory with two disk drives and a printer. The Model III version of the program will handle 1000 students on a 48K two disk system. Model II price is $995, and the Model III version is $650. Bertamax Inc., 101 Nickerson, Suite 202, Seattle, WA 98109. (206) 282-6249.

SofTeach is a computer-aided instruction package that helps programmers learn to use and understand UCSD Pascal. It supports application program software written in UCSD Pascal as well as Fortran-77 and Basic. The Aquizzes quiz questions the student about various aspects of the UCSD Pascal language. The Pquizzes quiz tests the student's ability to implement this knowledge by writing procedures and functions. SofTeach is $125. SofTech Microsystems, 9494 Black Mountain Rd., San Diego, CA 92126. (714) 578-6105.

Computer Assisted Instruction is available for the mentally handicapped. Colorful animated graphics programs use synthesized speech and teach basic counting and word recognition skills to those who have learning problems. This software is available for the Apple II Plus, Atari 400/800, Texas Instruments 99/4 and 99/4A, and the VIC-20 on disk and tape. $29.95. The Upper Room Computer Consultants, 907 6th Ave. East, Menomonie, WI 54751. (715) 235-5775.

The Adventures of Oswald is a combination game and story for Atari computers that incorporates voice narration, graphics, color, music, and sound effects for children between the ages of three and six. By using the joystick, a child can make Oswald walk, climb, and jump. A game, called "Oswald and the Golden Key," is also included. The cassette version, which requires 16K, retails for $16.95. The disk version, which requires 24K, retails for $23.95. Program Design, Inc., 11 Idar Ct., Greenwich, CT 06830. (203) 661-8799.

T.E.S.T. is a worksheet and test authoring program for the classroom teacher. It includes a maintenance program and a test and drill program. T.E.S.T. is available for the TRS-80 Model III. A two disk system is $24.95, and a cassette is $13.95. TYC Software, 40 Stuyvesant Manor, Geneseo, NY 14454. (716) 243-3005.

RECREATIONAL

Mysterious Adventures Part 1 is an adventure in which the player has 30 puzzles to solve within a context of 60 rooms. In it the player must try to alleviate the blight and succeed where the King's Sorceror has failed. It is available on cassette or disk for the TRS-80 I/III for $19.95. Acorn Software Products, Inc., 634 North Carolina Ave. SE, Washington, D.C. 20003. (202) 544-4259.

Hayden Software branches into the realm of the arcade game with **Kamikaze**, As commander of your ship, you must ward off enemy bombs, mines, and planes. As your score increases, so does the frequency of enemy attacks. **Kamikaze** runs on the Apple II with disk, 48K, and Applesoft. It costs $34.95. Hayden Software, 600 Suffolk St., Lowell, MA 01853.

Computerware has released **Rail Runner**, a new arcade style game for the Radio Shack Color Computer and TDP System 100. The game pits the player, as railroad engineer, against the toughest train switchyard ever. **Rail Runner** is $21.95 on cassette, and $26.95 on disk. Computerware, Box 668, Encinitas, CA 92024.

STOP PLAYING GAMES

PET/CBM
APPLE
TRS-80 (Model I & III)
COLOR-80
VIC-20

- Calculate odds on HORSE RACES with ANY COMPUTER using **BASIC**.
- SCIENTIFICALLY DERIVED SYSTEM really works. TV Station WLKY of Louisville, Kentucky used this sytem to predict the odds of the 1980 Kentucky Derby. See the Wall Street Journal (June 6, 1980) article on Horse-Handicapping. This system was written and used by computer experts and is now being made available to home computer owners. This method is based on storing data from a large number of races on a high speed, large scale computer. 23 factors taken from the "Daily Racing Form" were then analyzed by the computer to see how they influenced race results. From these 23 factors, ten were found to be the most vital in determining winners. NUMERICAL PROBABILITIES of each of these 10 factors were then computed and this forms the basis of this REVOLUTIONARY NEW PROGRAM.
- SIMPLE TO USE. Obtain "Daily Racing Form" the day before the races and answer the 10 questions about each horse. Run the program and your computer will print out the odds for all horses in each race. COMPUTER POWER gives you the advantage!
- YOU GET:
  1) TRS-80 (Level II), Color-80, Apple or PET/CBM or VIC-20 Cassette.
  2) Listing of BASIC program for use with any computer.
  3) Instructions on how to get the needed data from the "Daily Racing Form"
  4) Tips on using the odds generated by the program.
  5) Sample form to simplify entering data for each race.

———————————MAIL COUPON OR CALL TODAY———————————

3G COMPANY, INC. DEPT. CC **(503) 357-9889**
RT. 3, BOX 28A, GASTON, OR 97119

Yes, I want to use my computer for FUN and PROFIT. Please send me ______ programs at **$24.95 each.**

I need a ☐ TRS-80 ☐ Color-80 ☐ Apple ☐ PET/CBM ☐ VIC-20 Cassette.

Enclosed is: ☐ check or money order ☐ Master Charge ☐ Visa

Card No. ____________________ Exp. date ______

NAME ____________________

ADDRESS ____________________

CITY ____________ STATE ______ ZIP ______

START USING YOUR COMPUTER FOR
FUN and PROFIT!

DISK DRIVE WOES?
PRINTER INTERACTION?
MEMORY LOSS?
ERRATIC OPERATION?

Don't Blame The Software!

Pat. #4,259,705
ISO-1
ISO-2

Power Line Spikes, Surges & Hash could be the culprit! Floppies, printers, memory & processor often interact! Our patented ISOLATORS eliminate equipment interaction AND curb damaging Power Line Spikes, Surges and Hash. MONEY BACK GUARANTEE!

- **ISOLATOR (ISO-1) 3 filter isolated 3-prong sockets; integral Surge/Spike Suppression; 1875 W Maximum load, 1 KW load any socket $69.95**
- **ISOLATOR (ISO-2) 2 filter isolated 3-prong socket banks; (6 sockets total); integral Spike/Surge Suppression; 1875 W Max load, 1 KW either bank $69.95**
- **SUPER ISOLATOR (ISO-3) similar to ISO-1 except double isolation & Suppression $104.95**
- **SUPER ISOLATOR (ISO-11) similar to ISO-2 except double isolation & Suppression $104.95**
- **MAGNUM ISOLATOR (ISO-17) 4 Quad Isolated sockets; For ULTRA-SENSITIVE Systems $181.95**
- **CIRCUIT BREAKER, any model (Add-CB) .... Add $9.00**
- **REMOTE SWITCH, any model (Add-RS) .... Add $16.00**

AT YOUR DEALERS

MasterCard, Visa, American Express
ORDER TOLL FREE 1-800-225-4876
(except AK, HI, PR & Canada)

ESP Electronic Specialists, Inc.
171 South Main Street, Box 389, Natick, Mass. 01760
(617) 655-1532

CIRCLE 190 ON READER SERVICE CARD

You've invested a lot of time and money into your computer . . .
It's time that investment paid off!

THE COLOR ACCOUNTANT

The Programmer's Institute introduces **THE COLOR ACCOUNTANT**, the only complete personal financial package specifically designed for the Atari 400/800 and the TRS-80 COLOR computers. This unique package includes:

1. Complete Checkbook Maintenance	**5. Payments/Appointments Calendar**	**8. Home Budget Analysis**
2. Chart of Accounts Maintenance	**6. Color Graph Design Package (graphs any files)**	**9. Decision Maker**
3. Income/Expense Accounts		**10. Mailing List**
4. Net Worth Statement	**7. Check Search**	

After the initial setup, **THE COLOR ACCOUNTANT** requires less than an hour of data input each month.

The checkbook maintenance program is the key to the entire package. Once your checkbook is balanced, the checkbook summary file will automatically update the home budget analysis, net worth, and income/expense statements. You can then graph any file, record bills and appointments, make decisions, print a mailing list, analyze various accounts or stocks, and even calculate taxes.

All programs are menu-driven and allow add/change/delete. Each file and statement can be listed to screen or printer, and saved to cassette or diskette. **THE COLOR ACCOUNTANT** also comes with 40 pages of documentation that leads you step-by-step through the entire package. The TRS-80 COLOR Ext. Basic requires 16K; the Atari 400/800 requires 24K for cassette and 32K for diskette **($74.95 cassette, $79.95 diskette).**

THE TAX HANDLER

The perfect supplement to **THE COLOR ACCOUNTANT, *The Tax Handler*** includes:

1. **Complete Form 1040**
2. **Schedule A (Itemized Deductions)**
3. **Schedule G (Income Averaging)**

This year let ***The Tax Handler*** prepare *your* taxes **($24.95 cassette, $29.95 diskette).**

See your local dealer or order direct:

THE PROGRAMMER'S INSTITUTE
a division of **FUTUREHOUSE**
P.O. BOX 3191, DEPT. A
CHAPEL HILL, NC 27514

1-919-489-2198
10 AM - 9 PM, Mon - Sat

CIRCLE 281 ON READER SERVICE CARD

NEW! For the Apple 48K . . .

PSYCHOLOGICAL

DIARY

Including . . .

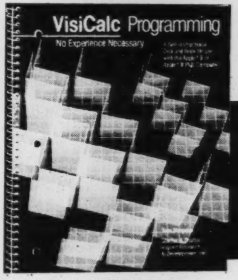
- Diary Keeper
- Dream Interpreter
- Personality/Relationship Testing
- Super-sophisticated ELIZA, programmed by psychotherapists using techniques from contemporary therapeutic schools
- Diary locked by user-supplied password
- Diary Search feature for user indexing
- Diary entries saved on disk, printed on printer
- Machine language for fast running
- For personal growth and self-exploration only; not a substitue for professional psychotherapy

$39.95 Obio residents add $2.60 sales tax

PSYCHOLOGICAL SYSTEMS
1519 Burlington Road - Cleveland Heights, OH 44118

CIRCLE 286 ON READER SERVICE CARD

HOURS NOT TO REASON WHY



NOW MASTER VISICALC®
PROGRAMMING IN
HOURS INSTEAD OF DAYS

Unique interactive software and easy-to-understand instructions for Apple II and Apple II Plus. In no time at all they'll have you and your VisiCalc® program humming along together. End the frustration. End the puzzlement. End the frustration. Send for *your* package today.

LITTLE, BROWN AND COMPANY
34 BEACON STREET, BOSTON, MA 02106

Send coupon to Janet W. Carlson, Little, Brown and Company
34 Beacon Street, Boston, MA 02106

Please send me *VisiCalc® Programming: No Experience Necessary.* by Tom Simpson.

☐ I enclose a check for $49.95 plus $2.50 shipping and handling (plus sales tax where applicable).

☐ Please charge my ☐ Master Charge ☐ VISA ☐ American Express

1 2

No.

Name

Exp. Date

Address

☐ I am a dealer. Please send additional info.

City State Zip

CIRCLE 221 ON READER SERVICE CARD

New Products, continued...

A new, expanded version of the **Original Adventure** game is available for Heath/Zenith, Osborne and other CP/M machines, from the Software Toolworks. The adventurer explores the dangers, seeks the treasures and solves the puzzles of Colossal Cave, in this machine language implementation. It contains all the details of the original game, plus new rooms and treasures, and an enhanced endgame. Software Toolworks, 14478 Glorietta Dr., Sherman Oaks, CA 91423.

Mystery and adventure highlight **Crypt of the Undead**, a new fantasy game for the Atari from Epyx Software. The player has twelve hours in which to set himself free from a cemetery and return to the land of the living. Should he fail, at dawn he will fall back asleep in his grave. As the player moves his joystick, the eerie contents of the graveyard unfold before his eyes in animated color graphics. **Crypt of the Undead** is available on disk for the Atari 400/800 with 32K and joystick controller. $34.95. Epyx, P.O. Box 4247, Mountain View, CA 94040.

Modec is a program which translates Morse code into characters. Written in machine language for the Apple II with DOS 3.3, Modec features a tunable audio filter that is keyboard tunable from 600 to 1500 Hz. Modec also converts Morse code to serial ASCII and sends each character to the game port. It comes on a 5 1/4" diskette and requires a patch cord for installation. $14.95. Cotec, 13462 Hammons Ave., Saratoga, CA 95070.

Snake video game requires 48K of RAM. The Snake moves about the screen, avoiding obstacles and eating food which appears at random for a short time. It is available on 5" dual format disks for Heath/Zenith computers and on 8" standard CP/M disk for systems with H19 terminals. $19.95. The Software Toolworks, 14478 Glorietta Dr., Sherman Oaks, CA 91423. (213) 986-4885.

K-Razy Kritters defies the player to save the Command Ships through ten increasingly difficult levels of play. This game is in ROM cartridge form for Atari 400 and 800 Personal Computer Systems. K-Byte, Division of Kay Enterprises Co., 1705 Austin, Troy, MI 48084. (313) 524-9878.

There are four games in the Rapidfire line: **Cytron Masters** puts the player in command of an army of cytrons who battle other cytron armies, $39.95; **Galactic Gladiators** features a collection of bizarre creatures from the Bubble galaxy, $39.95; the **Cosmic Balance** has the player assume the dual role of commander and architect of a starship fleet, $39.95; and **Shoot 'Em Up In Space** allows players to build ships from a choice of six prototypes to form squadrons and fleets, $39.95. **Guadalcanal Campaign** is a monster computer wargame that is a 40- to 80-hour long simulation of America's most devastating conflict with Japan. $59.95. All games are designed for the 48K Apple II Plus, Apple III, or Apple II with Applesoft ROM Card. Strategic Simulations Inc., 465 Fairchild Dr., Suite 108, Mountain View, CA 94043. (415) 964-1353.

Millionaire is an educational stock market simulation game that both teaches and entertains. The game includes margin accounts, call and put options, news reports, volume indicators, and more. System requirements for Millionaire are: for the IBM PC, one disk drive, PC DOS, 64K memory, and either video board; for the Apple, one disk drive, DOS 3.3, and 48K memory; and for the TRS-80, a Model III system, one disk drive, and 48K memory. $49.95. Micro-Z Applications, 22704 Ventura Blvd., Suite #141, Woodland Hills, CA 91364. (800) 835-2246.

Command Strategy Football

An exciting 2-player game that lets YOU BE THE COACH!

Easy for beginners and challenging for veteran armchair quarterbacks!

JUST $34.95 complete
Allow 3 weeks for delivery.

Comes complete with instruction book. Programmed for **APPLE II** and **APPLE II+** computer with 48K Ram FP.

Make check or money order payable to: **RANCO SOFTWARE GAMES, INC.** 4 Bartlett Ave., Roanoke, Al. 36274. For faster service on orders only call: **[205] 863-4718.**
Master Charge or Visa accepted. Please give card number and expiration date.

Ranco Software Games, Inc.
No. 4 Bartlett Ave.
Roanoke, AL 36274

*Apple is the trademark of the Apple Computer Corp.

CIRCLE 292 ON READER SERVICE CARD

LEARN VISICALC™
THE EASY WAY WITH READY-MADE TEMPLATES

Construction Job Cost $49.95
Finance $49.95
Real Estate $49.95
Home $29.95
Retailing $49.95
Engineering $49.95

Load your Visicalc™ with our templates, then key your numbers in.
DO YOUR:

ESTIMATING IN CONSTRUCTION JOB COST — The Building Site • Preliminary Costs • Site Clearing, Excavation, and Fill • Footings • Foundation • Floor System • Super Structure • Roofing • Electrical, Plumbing, Heating, and Air Conditioning • Brickwork • Energy Saving Materials • Interior Wall and Ceiling Finish • Exterior Trim • Concrete Floors, Walks, and Terrace • Interior Trim • Painting, Floor Covering and Appliances • Gutters, Onsite Improvements and Misc. • Overhead Contingency and Profit.

ANALYSIS IN FINANCE — Break-Even Analysis • Cash Budget • Pro-Forma P&L • Pro-Forma Balance Sheet • Ratio Analysis • Depreciation Tables (5) • Net Present Values.

PROJECTIONS IN REAL ESTATE — NIREB Forms: CID B — Property Analysis • CID C — Comparative Investment Analysis • CID D — Individual Tax Analysis • CID G — Excess Depreciation • Net Proceeds • CID I-A — Internal Rate of Return.

BUDGETS FOR THE HOME — Personal Budget • Shopping List • Mortgage and Loan • Individual Retirement Account • IRS Schedule A.

Future Templates — Retailing • Energy Audit • Engineering • Statistics • Multi-Level Marketing. Customize Templates $30.

Run on Apple II • TRS-80 I, II, III • IBM PC • Atari 400, 800 • Commodore

Orders Only — (800) 525-9391 ext. 533
Inquiries — (714) 338-5075

COD — Cashiers Chk. or Money Order Only • Prepaid— Personal Check O.K. • UPS — Add $2.50 shipping and handling Street Address required. • Calif. — add 6.5% sales tax

SOFTWARE MODELS
"The Template People"
P.O. Box 1029
Crestline, CA 92325

CIRCLE 325 ON READER SERVICE CARD

Experience the Magazines of the Future . . . TODAY

MAGATARI™
for the Atari 400/800

TRC™
for the TRS-80 COLOR, Ext. Basic

appletree™
for the APPLE II+

The Programmer's Institute's magnetic magazines will entertain, educate, and challenge you.

Each issue features ready-to-load programs ranging from games, adventures, home applications and utilities to personal finance, educational, and our unique teaching programs. Our magazines include fully listable programs, a newsletter containing descriptions and instructions for all programs, and notes on programming techniques used.

"Received my first copy . . . it's great! Please rush to me one of each back issue, so I'll have a complete set."
R.G., Chicago, IL

"Not only are the games fun and the applications useful, but the quality of the programs is excellent."
S.P., Midwest
Computer Software Sales

COMING SOON: VicVideo for the Vic-20 and PCM magazine for the IBM personal computer.
Plus Educational Software for the Atari 400/800.

ORDERING INFORMATION

Subscriptions*	Cassette	Diskette
Year	$50.00	$75.00
½ Year	$30.00	$45.00
Trial Issue	$10.00	$15.00

*** Add $2.00 postage and handling.**
ALL SOFTWARE REQUIRES 16K.
Note: Appletree is available only on diskette.

See your local dealer or order direct:
THE PROGRAMMER'S INSTITUTE
a division of **FUTUREHOUSE**
P.O. BOX 3191, DEPT. A
CHAPEL HILL, NC 27514

VISA MasterCard

1-919-489-2198
10 AM - 9 PM, Mon - Sat

CIRCLE 282 ON READER SERVICE CARD

THE SINCLAIR ZX81

Programming for Real Applications

Randle Hurley

The SINCLAIR
ZX81
programming for real applications

Here are 11 fully documented programs which will cast away any beliefs that the Sinclair ZX81 is too small for any real programming work.

These programs not only work, they are true work horses—doing real jobs in a variety of environments. Designed to run with the 16K memory module, the programs listed include a bulk storage program, word processor, financial applications, banking uses, plus educational programs. Software is available on cassette, and can be ordered from the back of the book. Programs will also run on the Timex Sinclair.

ISBN 0-88056-090-8 166 pages $9.95

New titles from dilithium Press
How to Use Supercalc®
PET® Basics
How to Build a Program

dilithium Press
P.O. Box 606
Beaverton, OR 97075

☑ Yes, Please send me the Sinclair ZX81 by Randle Hurley. I understand I may return it for a full refund if I am not satisfied.
☐ I enclose $9.95 plus $1 to cover shipping and handling.
☐ Or call our toll free number 1-800-547-1842 to charge your order on Visa or M/C.

☐ Please send me your free catalog—Brainfood

Name ______________________
Address ______________________
City, State, Zip ______________________
Mail to: dilithium Press, P.O. Box 606, Beaverton, OR 97075

CIRCLE 179 ON READER SERVICE CARD

m...software legal forum...s

Harold Novick

In prior "Forums," we have discussed the impact of warranties on personal computing systems. Unfortunately, one of our conclusions was that without a willing and friendly software or hardware vendor, there may be no recourse for the owner of software that does not run properly or hardware that breaks down.

In this "Forum," the problem of economically protecting the owner of an expensive system from unexpected calamities is addressed. In other words, we ask: Is there life insurance for personal computers?

In a letter to the "Forum," Stephen P. Arrants, Jr., of Oldwick, NJ, made the observation that there was a dearth of information about insurance for personal computing systems. Steve writes, "I have not seen an article—in either *Creative Computing* or any other periodical—that addresses the issue of insuring personal computer systems." Steve then suggested that this should be a topic for a future column.

While Steve may have a personal interest in this matter (he is the assistant editor of Best's Underwriting Guide, published by the A.M. Best Company, for the insurance industry), his point is well taken and I thank him for his suggestion.

If you believe legal topics are the most boring and uninteresting topics in the world, you have not been introduced to the world of insurance. A sure cure for insomnia is the reading of an insurance policy. In order not to enter into the practice of medicine, the question of insurance for personal computing systems and activities will be discussed with respect to a specific fact situation.

Assume that the insured party, whom we shall call Edward, owns a fairly sophisticated microcomputer system worth over $20,000. Such a system includes not only a respectable amount of hardware, it also includes a very respectable collection of software. This microcomputer system is used primarily for business purposes which include the management of a number of condominiums and the writing of development software under special contracts. The system is kept in a special room in Edward's home and contributes substantially to his primary source of income.

Disaster Strikes

Assume further the following: While Edward was away from home one evening, a very severe electrical storm occurred. Lightning struck the house and caused an electrical overload. This produced a voltage spike that was transmitted through the entire computer system which was on at the time.

While the house did not catch on fire, the water from the storm flooded the room in which the computer was kept. As a result of the electrical storm and the water damage, all of the hardware and peripherals were totally destroyed, and the media on which the computer programs were kept together with the supporting documentation, were ruined.

The questions then arise: What insurance should Edward have had and how fully can he be compensated?

Every insurance policy or contract has several parts. One part identifies the particular items that are insured. Another part identifies the risks that are being covered. A third part specifies the exclusions or those items and risks not covered. The remaining parts of the insurance contract specify the policy limits, the premiums, any deductibles, and a plethora of miscellaneous provisions.

So far the assumption has been made that insurance policies are available for personal computing systems. Believe it or not, that assumption is probably valid. Insurance companies with their terms and provisions are very similar to banks with their particular requirements for lending money. Thus, while the Allstate Insurance Company may not have the desired coverage for a microcomputer system, the St. Paul Fire and Marine Insurance Company might have it.

Furthermore, the terms and conditions of those companies which write such policies vary greatly, even to the extent that they may decide not to sell such a policy to certain people. In short, there are no standard criteria of insurability or of the insurance provisions that are available. Still, insurance companies are in the business to write insurance policies, and if the coverage needed is not offered, they may be convinced to provide it—even by a small businessman like Edward.

What Are The Damages

However, assume that in this hypothetical situation there was insurance for the destroyed microcomputer system. What damages were suffered in this case? First, there was the loss of the hardware system. Being a commercially replaceable system, the amount of the loss is easily ascertainable both by its initial purchase price and by its replacement cost depending upon how the insurance policy is written.

Second, the loss of the computer programs and the media on which they were stored, must be considered. In this case, the media were primarily floppy disks and magnetic tapes. Presumably, the loss of the hard disk could be included under either the hardware or the media.

For those computer programs which were purchased and used in their purchased form, the amount of the loss can be easily ascertained. On the other hand, the cost for a computer program which was either specially adapted or custom written, may be harder to ascertain. This is particularly true if the custom computer program has not been commercially sold and cannot be easily replaced. Presumably, the time and expense necessary to rewrite the software could be used as a guide as to its worth.

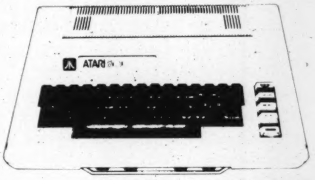
However, there are losses other than just the hardware and the computer programs. In this case, there was also a loss of the supporting documentation—the flowcharts, the comments to the programs, and the instructions on how to use the programs. The cost and replacement value of these documents are often not covered by commercially available insurance policies.

Another loss is called the "Extra Operating Expenses" loss. This loss is usually defined as those expenses over and above what it would normally cost Edward to conduct his computer oper-

---

Harold Novick, Patent Attorney, Larson and Taylor, Arlington, VA 22202.

SOFTWARE STREET



STOP BY AND VISIT OUR NEW STORE!

SOFTWARE STREET
14122 CENTRAL, SUITE E
CHINO, CA 91710
(714) 591-3061

Holiday Special

WE NOW CARRY SOFTWARE FOR THE APPLE AND VIC-20 COMPUTERS

800 16K	619^{00}	BLANK DISKS (10)	24^{95}	BOOKKEEPER KIT	169^{00}	CENTIPEDE	32^{95}
800 48K	639^{00}	PERCOM DISK DRIVE	549^{00}	BOOKKEEPER PROGRAM	99^{00}	CAVERNS OF MARS	27^{95}
810	429^{00}	PERCOM SLAVE DRIVE	339^{00}	VOTRAX TYPE & TALK	299^{00}	MISSILE COMMAND	25^{95}
400 16K	265^{00}	AXCOM GP-100	279^{00}	MICRO SOFT BASIC	62^{00}	ASTEROIDS	25^{95}
410 RECORDER	73^{95}	AXCOM IMP-4	469^{00}	ASSEMBLER/EDITOR	44^{95}	MUSIC COMPOSER	29^{95}
MICRO TEK 32K BOARDS	99^{00}	EDUCATOR	110^{00}	MACRO ASSEMBLER	64^{95}	MY FIRST ALPHABET	25^{95}
INTEC 48K BOARDS	175^{00}	ENTERTAINER	65^{00}	BASIC CARTRIDGE	44^{95}	INVITATION TO PROGRAMMING 2 & 3	21^{21}@
850 INTERFACE	159^{00}	PROGRAMMER	49^{95}	PAC-MAN	32^{95}		

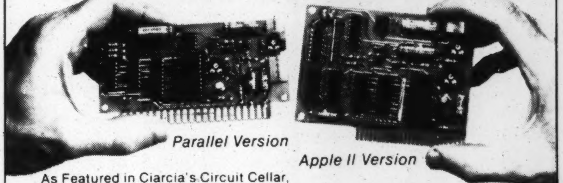
THE ABOVE PRICES ARE FOR PREPAID ORDERS

$ 2.50 MIN. SHIPPING ON SOFTWARE
HARDWARE SHIPPING WILL VARY - PLEASE CALL.

CALL OR WRITE FOR FREE PRICE LIST.

CIRCLE 327 ON READER SERVICE CARD

SWEET-TALKER, IT GIVES YOUR COMPUTER AN UNLIMITED VOCABULARY.



Parallel Version

Apple II Version

As Featured in Ciarcia's Circuit Cellar,
Byte Magazine, September 1981.

The Sweet-Talker voice synthesizer allows you to add speech of unlimited vocabulary to your computer. Utilizing the Votrax SC-01A chip, you can output any message by programming individual phonemes. Comes in two versions; one plugs directly into your Apple II, the other connects to any computer with an 8-bit parallel printer port. + 12 volts and + 5 volts required for parallel board.

- Contains 64 different phonemes accessed by a 6-bit code.
- Automatic and manual inflection modes.
- Parallel port driven or plug-in compatible with Apple II.
- Super text-to-speech algorithm on disk for Apple II. Makes Sweet-Talker equivalent to units 3 times the cost.
- On board audio amplifier
- Sample program on cassette with Apple II board.
- Optional power supply for parallel board.

ST01	**Sweet Talker Parallel Port Board A & T**	**$139.00**
ST02	**Sweet Talker Apple II plug in board**	**149.00**
ST06	**Text-to-Speech algorithm on disk for Apple II**	**.35.00**
SC01A	**Votrax Speech Synthesizer chip** **40.00 in 100's.**	50.00
UPS01	**Universal Power Supply-A & T**	**.35.00**

Add $2.00 for shipping & handling.

To Order: Call Toll Free 1-800-645-3479
(In N.Y. State Call: 1-516-374-6793)
For Information Call: 1-516-374-6793

MICROMINT INC.
917 Midway
Woodmere N.Y. 11598

MICRO MINT
Largest US distributor of Votrax chips.

CIRCLE 236 ON READER SERVICE CARD

FREE 1 STOP SHOP FOR MICROCOMPUTER GAMES

A Free Catalog — hundreds of the best games available anywhere. We selected the most challenging and most exciting arcade, strategy and simulation games — everything from adventure, fantasy, war games, sports to classic board games.

Now one-stop shopping is easy with a single game source for the most popular home computers: Apple, TRS-80, Atari, Commodore Pet & Vic, Texas Instruments and IBM. Full descriptions include hardware information.

Get your free games catalog today — simply send coupon below or call 1-800-431-2196.
N.Y.S. Residents — 914-769-2802

EAV

EAV Software Inc.
17 Marble Avenue; Pleasantville, N.Y. 10570

Yes, rush my FREE catalog of Micro games and accessories today!

Name ____________________
Address ____________________
City ____________________
State ____________________ Zip ________

CIRCLE 189 ON READER SERVICE CARD

ations had no damage occurred.

For example, in this case, it was necessary to rent an entire microcomputer system located 30 miles away to handle the condominium management task. The cost of travelling to and from the new site, the cost of any extra lodging or meals, and the rental cost above that which would normally have been paid are all included under a coverage for Extra Operating Expenses.

But that still is not everything. In this case Edward could not work full time and therefore lost part of his income as a direct result of the disaster. If Edward had "Business Interruption Insurance," then this loss would have been covered.

There is also the cost of replacing the source documentation for the condominium management business. This documentation includes the original bills and receipts from the condominium management operation and the payroll records for the employees. To cover this loss, some insurance companies offer "Valuable Papers Supplementary Coverage."

Finally, Edward may have lost some money from accounts receivable that could not be collected because of the lost records. Again, some insurance companies offer a supplementary coverage that will pay for any of these losses. Obviously, any supplementary coverage must be specifically requested, and will add to the cost of the basic policy.

Deductibles, Limits, And Exclusions

Edward was fortunate, because he had coverage for all the foregoing losses. However, that does not necessarily mean that he will be fully paid for these losses. Every insurance policy has at least two limitations to recovery, deductibles and coverage limits, and exclusions.

The deductible, simply stated, is an initial sum of money for each loss that must be borne by the insured and for which the insurance company will not pay.

Coverage limits are the maximum amount that the insurance company will have to pay for all losses due to one event. For example, in a data processing insurance policy written by the St. Paul Fire and Marine Insurance Company, the insurance company will be liable for all damages in excess of $500 but not more than $50,000 for the damage to the computer system caused by the storm.

Exclusions, on the other hand, encompass either certain risks that are not covered, (e.g., acts of war, government seizure, mechanical breakdown, programming errors, rust, and nuclear radiation) or some losses which are not covered (e.g., flowcharts and other computer program documentation).

A common exclusion which may have been applicable in Edward's case is damage caused by an electrical failure that occurs outside of the premises in which the computer system is located. For example, if the lightning had struck an electrical substation located a distance from Edward's house and either caused the damaging electrical voltage transition or resulted in the inability to operate the computer system and meet certain deadlines in preparing condominium reports, the resulting business loss would not have been covered.

In this case, the entire microcomputer system was located and operated in Edward's home and this fixed location was stated in his policy. However, if Edward had temporarily taken his microcomputer system to another location where the damage occurred, it is likely that either the damage would not be covered, or the maximum amount and type of coverage would be different.

Because of the easy transportability of microcomputer systems, this provision may be important. The possibility of damage away from the specified location also emphasizes the necessity of carefully

INTRODUCING THE THIRD GENERATION OF INVESTORS' SOFTWARE FOR THE APPLE.T.M.

THE INVESTOR'S TOOLKIT™

More complete than any other. Easier to use than any other. And you pay only for the systems you need. You can later "upgrade" any program package for just the price difference.

PROGRAM PACKAGES

(consisting of the programs as numbered below)

Chart Trader (contains #1, 4)	**$149.00**
Market Analyst (contains #1, 4, 15, 16)	**249.00**
Financial Trader (contains #1, 4, 5, 6, 9, 15, 16, 17, 18)	**499.00**
Professional Trader (contains #1, 3, 4, 5, 6, 8, 9, 12, 14, 15, 16, 17, 18)	**699.00**

Chart Trader and Market Analyst also available with Graphic Charting with Analysis II (#5) for $50.00 additional. Packages listed above may be upgraded for price difference only.

DATA MANIPULATION

1. Data File Management	$ 99.95
2. V-Comm	99.95

TECHNICAL ANALYSIS TOOLS

3. Advanced Graphics One	$199.95
4. Graphic Charting with Analysis	99.95
5. Graphic Charting with Analysis II	149.95
6. Gann Square of Nine	49.95
7. Swing Wave Day Counter	49.95
8. Fibonacci Projection	59.95

TRADING SYSTEMS WITH OPTIMIZATION

9. Moving Average Crossover	$149.95
10. Engineers System	199.95
11. Parabolic System	99.95
12. Directional Movement System	99.95
13. Swing Index System	99.95
14. Relative Strength Index System	99.95

TRADING SYSTEMS

15. Wilders 6 Systems	$129.95
16. Relative Strength Index Trading System	49.95
17. Engineers System	69.95
18. Colver Method	39.95
19. Trend Master	99.95
20. CSR 1: Moving Average with % Price Band	79.95
21. CSR 2: Directional Indicator	79.95
22. CSR 3: L-S-O Price Channel	79.95
23. CSR 4: Range Quotient System	79.95
24. CSR 5: M-II Price Channel	79.95
25. CSR 6: Dual Moving Average	79.95
26. CSR 7: The Outside Price Channel	79.95
27. CSR 8: Reference Deviation System	79.95
28. CSR 9: Trend-Countertrend Hybrid	79.95
29. CSR 10: High-Low Moving Average Breakout	79.95

Send $5 (credited to your first purchase) for a demonstration disk (if you don't have an Apple, any dealer will run it for you). Mastercard and Visa holders order toll-free, 1-800-835-2246. *(Demo not available through 800 number.)*

OMEGA MICROWARE, INC.™
222 SO. RIVERSIDE PLAZA
CHICAGO, IL 60606
312-648-1904

Software by
Orion Management, Inc.

© 1982 Omega MicroWare, Inc.

Apple is a registered trademark of Apple Computer, Inc.

CIRCLE 255 ON READER SERVICE CARD

reading the contract and understanding the coverage.

Other coverage not provided might include in specific cases, loss of data and media that is irreplaceable, or damage arising from a mechanical breakdown of the system which occurs independent of the perils. Thus, a mechanical breakdown from the electrical storm would be covered, but a mechanical breakdown because of a part deficiency may not be covered.

Another major part in an insurance contract is the particular limits for the policy coverage. The St. Paul policy which can be written for a microcomputer system has a $10,000 standard coverage for hardware and an automatic coverage of $7000 for the computer program and media losses. If the value of the hardware or the covered software is greater than these limits, then additional coverage must be obtained.

Other Provisions

Other provisions of the insurance contract cover miscellaneous items such as the right of the insurance company to make inspections and conduct audits, provisions for when the policy premiums must be paid and renewed, and the consequences if not done, and termination situations.

Edward's policy included an "all perils" coverage. Translated this means that the general perils of fire, flood, wind damage, water damage, and theft are covered. However, insurance companies often require installation of certain safety devices or compliance with certain safety standards before they will write the insurance. For example, Edward may have had to have installed a lightning arrestor or electrical voltage peak suppressor.

Edward already had the insurance. How did he obtain it? According to Marr T. Haack of the St. Paul Fire and Marine Company, Edward could have obtained an insurance policy for his system in two ways. If he had not used the computer system in his business, then he could have obtained a rider to his home owner's policy from his insurance agent. Such a rider, however, probably would not have included such coverages as Business Interruption and Extra Operating Expenses coverage. Of course, there is also the possibility that his insurance company does not have a rider that specifically covers computer systems. While the hardware may be covered under the general loss provisions of personal property in a home owner's policy, it is questionable whether the computer programs would be covered because they may not be classified as tangible personal property.

The other approach, and the one used by Edward to obtain insurance, is to get a standard business insurance policy that specifically covers computer systems. The insurance companies handling these policies, such as St. Paul, normally do not sell the insurance policies directly, but deal through independent insurance agents. The names of local insurance agents can be found in the Yellow Pages of the telephone directory under "Insurance" and under either the agent's name or in some cases under the name of the insurance company. In any event, using the Yellow Pages is definitely the first step in obtaining the insurance coverage. The second, more difficult step is finding someone who is familiar with computers and can write a policy.

Finally, who should obtain such a policy? The cost for the above mentioned St. Paul insurance policy might be as low as $100 a year, and should cost within the range of $100 to $250 per year, depending upon the exact nature of the coverage. At that price, anyone using a microcomputer system in his business who does not get the insurance is making a big mistake. ☐

Get better looking with your IBM.

Introducing the PC Pedestal™ from Curtis Manufacturing

Available at all ComputerLands and finer computer stores.

Now you can get a real good look at your IBM Personal Computer or Displaywriter.

With Curtis Manufacturing's new PC Pedestal™ you can tilt or swivel the IBM display unit to suit yourself.

No more bobbing and weaving to avoid reflections. No more squinting to minimize glare.

The PC Pedestal™ virtually eliminates backache, eye strain, and fatigue. And that results in greater comfort and increased productivity all around.

Developed exclusively for the IBM Monochrome Display, the PC Pedestal™ is a perfect match in style, color & finish.

Best of all, when you see how little it costs to gain these benefits, you're going to be looking better already.

Extension Cables, too.

For even greater flexibility in arranging your system components, a 3-foot extension cable set is also available for your IBM display unit.

Manufacturing Company

CURTIS

For credit card orders
call: 1-800-824-7888
in California
1-800-852-7777
in Alaska & Hawaii
1-800-824-7919
ASK FOR OPERATOR 157

	PRICE	QTY.	AMOUNT
PC PEDESTAL™	$79.95		
EXTENSION CABLES	49.95		
postage per item	3.00		
CC1	TOTAL		

NAME ____________

COMPANY ____________

ADDRESS ____________

CITY ____________ STATE ________ ZIP ________

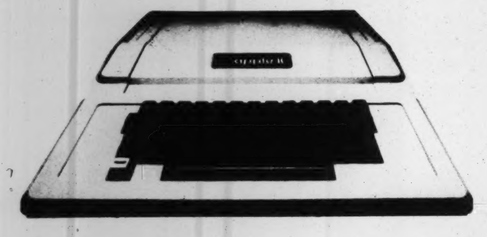
MAIL TO:
Curtis Manufacturing Co.,
One Curtis Road, Winchester, NH 03470

☐ check ☐ money order ☐ Master Card ☐ VISA ☐ send additional information

account # ____________ Master Card Interbank # ____________

SIGNATURE ____________ expiration date ____/____ month year

CIRCLE 168 ON READER SERVICE CARD



le cart...apple cart...apple

Chuck Carpenter

In my last column, I indicated that additional information about printing in Pascal would be included. It will be this month. Responses to the March '82 column were received from several readers. At least two were from readers who teach Pascal as a structured language. Other items to be included this month are the usual one-liners and more questions-n-answers.

Rosa Pascal Sez

Printing to physical devices in UCSD Pascal, especially the Apple version, is sometimes complicated. The first time I tried to do it was in response to a question from James Pittman. Results of the interchange were published in the March '82 column. Listings 1 and 2 were sent in response by Sharon Burrowes. Sharon (one of the teachers) felt that even further simplification and discussion were needed for the beginner. Along with the listings, she sent information from an article explaining the method. The source of the article has been lost, but the author is James Hugard. Paraphrasing the article, the rationale for this approach to printing is something like this:

- To assign a variable name to a physical device, use interactive type variables.
- Use REWRITE to assign the variable (X) to the physical device (printer) and open the file for output.
- Use the variable (X) with the command WRITELN to identify the physical device to receive the output from the REWRITE statement.

The article goes on to say that REWRITE is the key statement. It makes the physical connection between the PRINTER file, and the PRINTER: physical device.

James Hugard also recommends the book *Beginners Guide for the UCSD Pascal System*. It was written by Kenneth L. Bowles (author of UCSD Pascal) and is published by Byte/McGraw Hill. The programs and information in the book can be used with Apple Pascal. An appendix shows the specific requirements to use the text examples with the Apple.

Sharon also included information about other printing problems. For instance, it is not immediately obvious that you should use the T(ransfer) function from the F(iler) to get a listing of a program. And, if you want a compiled listing printed, you must insert (*$L PRINTER:*) in your program. Also, if you want to print a directory listing, you must specify the physical device. The method for doing this is shown on page 58 of the Operating System manual.

Other Ways Too

Another approach to the Pascal printing problem was sent by Karen L. Lopilato

Chuck Carpenter, 3714 Bishop Hill Dr., Carrollton, TX 75007.

Listing 1.

```
(*THIS PROGRAM SHOWS HOW TO OUTPUT TO A PRINTER IN PASCAL*)
PROGRAM PRINTOUT;

VAR X : INTERACTIVE;
   (NOTE: THIS VARIABLE WILL BE USED*)
   (*     WHEREVER PRINTER OUTPUT IS NEEDED*)

BEGIN (*PRINTOUT)
REWRITE(X, 'PRINTER:');

WRITELN(X,'THIS LINE WILL APPEAR ON THE PRINTER.');
WRITELN('THIS LINE WILL APPEAR ON THE SCREEN.');

END.  (*PRINTOUT*)
```

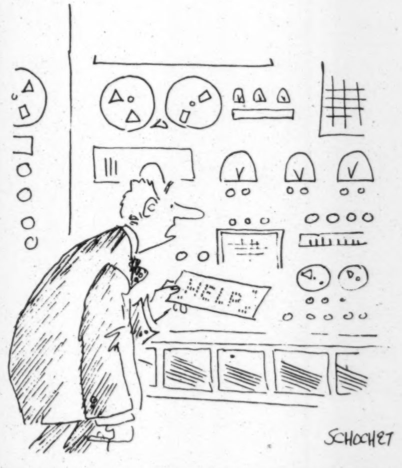
Listing 2.

```
(*THIS PROGRAM SHOWS ANOTHER OPTION FOR PRINTER OUTPUT IN PASCAL*)
PROGRAM PRINTOUT;

VAR X : INTERACTIVE;
   (*NOTE: THIS VARIABLE WILL BE USED*)
   (*      WHEREVER PRINTER OUTPUT IS NEEDED*)

   DEVICE : STRING[10];  (*THIS WILL BE USED TO DETERMINE *)
                         (*THE DEVICE TO BE USED FOR OUTPUT*)

BEGIN (*PRINTOUT*)
WRITELN('WHAT OUTPUT DEVICE DO YOU WISH? ');
WRITELN(' (P = PRINTER, S = SCREEN)'):
READLN(DEVICE);
IF DEVICE = 'P'
   THEN DEVICE := 'PRINTER:'
   ELSE DEVICE := 'CONSOLE:';
REWRITE(X,DEVICE);

WRITELN(X,'THIS WILL APPEAR ON THE DEVICE SELECTED.');
WRITELN('THIS LINE WILL DEFAULT TO THE SCREEN.');

END.  (*PRINTOUT*)
```

Listing 3.

```
(*                      JAMES C. PITTMAN JR.                               *)
(*          WITH        REVISIONS -  KAREN L. LOPILATO                     *)
(*             WRITE OUT A TABLE OF ASCII CHARACTERS TO A PRINTER          *)
(*    THIS IS A SAMPLE PASCAL PROGRAM TO DEMONSTRATE PRINTING INPUT AND   *)
(*OUTPUT FROM WITHIN A PROGRAM. WITH CHANGE -  INITIALIZE Y TO 1 RATHER   *)
(*THAN 0.  ALSO, A WRITELN(FID) HAS BEEN INCLUDED  AT END OF PROCEDURE,   *)
(*DISPLAY, SO THAT LAST LINE WILL BE PRINTED WITH A "BUFFER" PRINTER.     *)
(*THIS PROGRAM DEMONSTRATES AN ESSENTIALLY DIFFERENT WAY TO OBTAIN        *)
(*OUTPUT ON THE PRINTER.  INTERACTIVE FILES ARE NOT NECESSARY; INSTEAD    *)
(*FID IS DECLARED A TEXT FILE, AND OUTPUT MAY BE TRANSFERRED TO IT WHEN   *)
(*DESIRED. THIS TECHNIQUE UTILIZES STANDARD PASCAL, RATHER THAN SPECIAL   *)
(*APPLE PASCAL.   APPLECART -- CREATIVE COMPUTING -- MARCH 1982           *)
PROGRAM PRINTEST(INPUT,OUTPUT);
VAR      X,Y,Z : INTEGER;
         MODE  : STRING[8];
         FID   : text;

PROCEDURE  DATA;                  (* GET "LINE WIDTH" INPUT.               *)
BEGIN
  WRITELN(FID); (* "FILEID" OR IDENTIFIER OF A PREVIOUSLY DECLARED FILE *)
  WRITELN(FID,'ENTER AN INTEGER BETWEEN 7 AND 26,');
  WRITELN (FID,'OR 0 TO STOP. ');
  READLN(Z);WRITE(FID,'  (',Z,')')
END;
PROCEDURE DISPLAY;                                     (*WRITE SOME OUTPUT *)
BEGIN
  Y := 1;                         (* INITIALIZE LINE WIDTH                 *)
  WRITELN(FID);                   (* Y SET TO 1.                           *)
  FOR X := 32 TO 127 DO
    BEGIN (*FOR*)
      WRITE(FID,' ',CHR(X),' '); Y := Y+1;
      IF Y > Z THEN
        BEGIN
          Y := 1;
          WRITELN(FID)
        END; (*IF*)
    END; (*FOR*)
    WRITELN (FID)                 (*WRITELN NECESSARY HERE, OTHERWISE AN   *)
                                  (*INCOMPLETE LAST LINE WON'T BE PRINTED  *)
                                  (*ON SILENTYPE PRINTER, OR ANY PRINTER   *)
                                  (*THAT PRINTS LINE BY LINE.              *)
END; (* DISPLAY *)
BEGIN (* MAIN *)
  Z := 1;
  WHILE Z <> 0 DO
  BEGIN
    WRITELN;
    WRITELN('SELECT EITHER CONSOLE: OR PRINTER: ');
    READLN(MODE);
    REwrite(FID,MODE);
    DATA;
    IF Z<> 0 THEN
      DISPLAY;
    CLOSE (FID);
  END (* WHILE *)
END. (* MAIN *)
```

e.g.: Centronics 737
MX-80



Listing 4.

```
PROGRAM TYPEWRITER;
VAR  STRANG : STRING;
     P  : TEXT;

     BEGIN

REWRITE(P, 'PRINTER:XX.TEXT');
REPEAT
READLN(STRANG);
IF STRANG='*' THEN EXIT (PROGRAM);
WRITELN(P,STRANG);
UNTIL STRANG='*';
CLOSE(P);
END.
NOW IS THE TIME
FOR ALL GOOD MEN
TO COME TO THE AID
OF THEIR COUNTRY.
```

Example of program use. Each line ends with return.

wabash®

When it comes to Flexible Disks, nobody does it better than Wabash.

MasterCard, Visa Accepted.
Call Free: (800) 235-4137

PACIFIC EXCHANGES
100 Foothill Blvd
San Luis Obispo, CA
93401 (In Cal call
(805) 543-1037)

CIRCLE 262 ON READER SERVICE CARD

SOFTWARE FOR THE ATARI
For the ATARI 400/800 Computers

WORD SEARCH PUZZLE MAKER—Make word search puzzles with your words or ours and an 80-column printer. **24K Cassette: $24.95 24K Disk: $24.95**

CHRISTMAS MUSIC—SETS 1, 2, & 3. Sing along with your Atari. Words and music (8 carols each). For use with the Atari Music Composer cartridge. Great gift for the whole family. **16K cassette, 16K Disc - $24.95 each. Specify set number.**

ATARI 400/800 CARTRIDGES—Centipede, Missile Command, Pac-Man, Space Invaders, Super Breakout, Chess, Asteroids. $33.00 each or 3 for $90.00; other products available—write for catalog.

All programs come with a manual. Disk versions come with AUTORUN.SYS file.
Please add $2 postage and handling per order.
Michigan residents add 4% sales tax.

Computer's Voice
2370 Ella Dr.—Dept. 130
Flint, MI 48504
(313)-238-5585

CIRCLE 153 ON READER SERVICE CARD

Verbatim® Diskettes

Top-quality Verbatim® Diskettes from **Tech•Data**, your complete word and data processing supply center. Dealer inquiries invited.

Call Toll Free
1-800-237-8931.
In Florida, call
813-577-2794.

Tech•Data Corporation
3251 Tech Drive North
St. Petersburg, FL 33702

CIRCLE 350 ON READER SERVICE CARD

Get Serious About

ZX81

Computing

PROFESSIONAL KEYBOARD. Makes your ZX81 easier to use. Enter programs quickly and error-free. Plugs straight into your ZX81 without any soldering. Has 47 keys and a full space bar. **$85.00**

32K RAM. Expand the memory capacity of your ZX81 with this direct-plug-in module. Fully compatible with Sinclair's 16K RAM (to give your ZX81 system a full 48K). **$99.95**

64K RAM. Expand your ZX81 memory capacity to its maximum. Plugs in directly to your ZX81. **$149.95**

Software on Cassette

MULTIFILE PLUS. Data storage system for 16K to 64K systems. Flexible, user-defined setup. Includes program tape, detailed instruction manual, 3 data tapes, storage case. **$34.95**

GAMES

MAZOGS A maze-adventure	$9.95
INVADERS 10 levels of play	$9.95
STAR TREK Zap the Klingons	$9.95
DICTATOR Political adventure	$14.95

Call (716) 874-5510 for Visa, MC Orders.

GLADSTONE Electronics

Mail order to 1585 Kenmore Ave., Buffalo N.Y. 14217
Checks or money orders. No CODs. Add shipping

CIRCLE 228 ON READER SERVICE CARD

CONTROL DATA
DISKETTES

5 1/4" SPECIFY SOFT, 10 or 16 SECTORS

	PRICE/10	PRICE/50	PRICE/100
SSSD	$23.00	$112.00	$215.00
SSDD	26.00	126.00	235.00
DSDD	32.00	156.00	295.00

8" SPECIFY SOFT or 32 SECTORS

	PRICE/10	PRICE/50	PRICE/100
SSSD	$25.00	$122.00	$223.00
SSDD	30.00	145.00	263.00
DSDD	34.80	165.00	303.00

CALL TOLL FREE - ORDERS ONLY
800-824-7888 ALL STATES EXCEPT CA
800-852-7777 FOR CA RESIDENTS
ASK FOR OPERATOR #906

CHECKS, M.O., VISA, M.C. - ADD $2.00 SHIPPING
CA RESIDENTS ADD 6% SALES TAX

Creativity Unlimited
P.O. Box 3304, Saratoga, CA 95070-1304

CIRCLE 164 ON READER SERVICE CARD

Unusual software
FROM
TYRANT®
FOR
Atari 400, Vic20, TI 99/4
Timex 1000, Sinclair ZX81

TITLES INCLUDE

PARTY GAMES ☐ PARTY GAMES FOR CONSENTING ADULTS ☐ COLLEGE and PRO BASKETBALL ☐ FOOTBALL ☐ US OPEN GOLF and TENNIS ☐ Z-TREK TRIVIA QUIZ ☐ PRIMARY (age 3 to 6) ASSOCIATION ☐ ARITHETIC BASEBALL

SEND $1.00 FOR CATALOGUE (credit on first order) TO:

TYRANT....... Software
BOX 31569, AURORA, COLO. ☐ 80041

CIRCLE 267 ON READER SERVICE CARD

and is shown in Listing 3. This example, a modification of the one by James Pittman, shows how to print from a program without interactive files. Karen also demonstrated a technique for directing the output to either the console or the printer from within the program. It is a much longer program, though, and I chose to include the simpler, shorter one. The program (Listing 3) is well annotated and should be easy to understand.

John R. McClenon's contribution in Listing 4 lets you use the Apple as an uppercase typewriter. It accepts a line of text which you can correct until you press RETURN. When RETURN is pressed, the line of text is passed to the printer. With lowercase capability added you could use this as a primitive text processor. John also suggests using the Pascal text editor to create a file. Pascal 1.1 has upper and lowercase capability. Once you have created a text file, you can transfer the file to the printer using the available F(iler) commands.

Our last contribution for this session was sent by Verne Thomas. Verne was experiencing some problems with his CPS Multifunction card. He has to set the printer parameters for use with Pascal from Basic. The March '82 article stimulated his thinking, and the program in Listing 5 was the result.

With this program you can send character font and control codes to your printer. According to Verne, "it is procedure SETPRINTER that actually sets up the printer. Within is included a procedure RESTORE which insures

Listing 5.

```
PROGRAM PRINTER;
 VAR CHOICE      : CHAR;
     OUTFILE     : TEXT;
 PROCEDURE SETPRINTER;
  VAR PRINT       :INTEGER;                (*STORES PRINT STYLE CHOICE*)
      PRINTERFILE:TEXT;                    (*SENDS CHOICES TO PRINTER*)
  PROCEDURE RESTORE;                       (*SETS DEFAULT CHOICES*)
   BEGIN
     WRITE(PRINTERFILE,CHR(27),CHR(72));
     WRITE(PRINTERFILE,CHR(27),CHR(70));
     WRITE(PRINTERFILE,CHR(18));
     WRITE(PRINTERFILE,CHR(20));
   END;
  BEGIN                                    (*SETPRINT*)
    PAGE(OUTPUT);  GOTOXY(4,1);
    WRITELN('**BE SURE PRINTER IS TURNED ON**');
    GOTOXY(13,4);WRITELN('PRINTER SETUP');  GOTOXY(0,6);
    WRITELN('1. DOUBLE STRIKE PRINT.');
    WRITELN('2. EMPHASIZED PRINT.');
    WRITELN('3. COMPRESSED PRINT.');
    WRITELN('4. DOUBLE WIDTH PRINT.');
    WRITELN('5. STANDARD PRINT.');
    WRITELN('6. **EXIT**');
    WRITELN;  WRITELN('MORE THAT ONE MODE IS POSSIBLE.');
    WRITELN('ENTER CHOICES ONE AT A TIME.');
    WRITELN;  WRITELN('ENTER CHOICE: ');
    REWRITE(PRINTERFILE,'PRINTER:');  RESTORE;
    REPEAT
     (*$I-*) (*TURN OFF ERROR CHECKING TO AVOID FATAL ERROR*)
     REPEAT
      GOTOXY(14,16);  READLN(PRINT);
      (*SETS CURSOR,  READS ENTRY*)
     UNTIL (PRINT >0) AND (PRINT<7) AND (IORESULT = 0);
     (*$I+*) (*TURN ON ERROR CHECKING AFTER GOOD ENTRY*)
     CASE PRINT OF
      1:WRITE(PRINTERFILE,CHR(27),CHR(71));
      2:WRITE(PRINTERFILE,CHR(27),CHR(69));
      3:WRITE(PRINTERFILE,CHR(15));
      4:WRITE(PRINTERFILE,CHR(14));
     END;
     GOTOXY(14,16);  WRITE(' ');           (*ERASES PRIOR ENTRY*)
    UNTIL PRINT = 6;
    CLOSE (PRINTERFILE);
  END;                                     (*SETPRINTER*)
 BEGIN                                     (*PRINTER*)
  REPEAT
   PAGE(OUTPUT);
   REPEAT
    GOTOXY(0,12);  WRITE('SET PRINTER TYPE STYLE?(Y/N)--> ');
    READ(CHOICE); GOTOXY(32,12); WRITE(' ');
   UNTIL (CHOICE = 'Y') OR (CHOICE= 'N');
   IF CHOICE= 'Y' THEN
     BEGIN
      SETPRINTER;
      REWRITE(OUTFILE,'PRINTER:');
      WRITELN(OUTFILE,'THIS IS THE STYLE THAT IS PRINTED.');
      WRITELN(OUTFILE);  CLOSE(OUTFILE);
     END;
  UNTIL CHOICE = 'N';
 END.                                      (*PRINTER*)
```

default values each time the procedure is entered. Thus, SETPRINTER could be included as a block in any program 'as is' since it requires no external parameters. Of course, procedure RESTORE must always have the appropriate entries to maintain a default setting each time SETPRINTER is called."

The program is for the Epson MX-80 but I think you could adapt it to other printers without much trouble. Just substitute the control codes for your printer for those of the MX-80. You can add other codes and controls to the procedure as required, too. My thanks to the contributors of these Pascal routines. As I have mentioned before, my skills in Pascal are limited. Therefore, these programs are included with very little checking.

Also, the disk sent to me by Karen, and the neat single-page program from Verne were greatly appreciated. The task of preparation is greatly simplified when I don't have to type the programs sent to me for the column. Usually copies made on thermal printers don't copy well. Neither do things printed with blue ink. Blue is optically invisible unless it has some red or black in it. Note, too, that if you want things returned, a stamped and return-addressed package is required.

One Liners

Some of the single-line programs I have received recently are quite elegant. It is amazing how much program you can pack into 255 characters. Of course it takes a great deal of creativity and effort to do it, so maybe it is not so amazing after all.

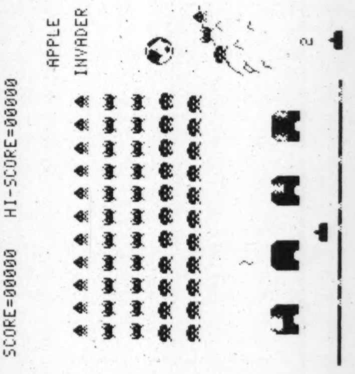
Listing 6 is a screen dump routine for the MX-70 printer from Bob Barash. The sample run shows what the program can do. As Bob points out, the program is a one-liner if you type it in using the ? for PRINT and eliminating the spaces. This is fair for typing since the Basic Interpreter will list it in proper form anyway. For hi-res page 2, use 16384 instead of 8192. Bob notes that some people pay as much as $50 for programs that do this.

Steven Wong, a repeat contributor, sent the program in Listing 7. This program turns the Apple into a drawing pad using lo-res graphics. We haven't had too many lo-res programs, so this one is a refreshing change.

The program in Listing 8 comes from Ivan Rous. This program only works if the random numbers work together. If all the random coordinates are close to each other, then the output is a mess. If the colors are all the same or if the color is black, the program can get quite boring. The number and size of shapes are up to the user, and can be changed as desired. Perhaps someone can suggest improvements to the program.

Listing 6.

```
2  REM HIRES PAGE1 TO EPSON MX70
4  REM TYPE ? INSTEAD OF PRINT
6  REM   BY: BOB BARASH
8  REM
10 D$ =  CHR$ (4):E$ =  CHR$ (27)
    : PRINT D$"PR#1": PRINT E$"A
    " CHR$ (7):: FOR I = 39 TO 0
     STEP  - 1: FOR J = 0 TO 80 STEP
    40: PRINT E$"K@" CHR$ (0):: FOR
    K = 0 TO 896 STEP 128: FOR L
     = 0 TO 7168 STEP 1024: WAIT
    49601,128,128: POKE 49296, PEEK
    (8192 + I + J + K + L): NEXT
    : NEXT : NEXT : PRINT : NEXT
    : PRINT E$"2": PRINT D$"PR#0
    "

]RUN
```



Listing 7.

```
10  REM  LO-RES PAD
20  REM  STEVEN WONG
30  REM  BROOKLYN,  N.Y.
40  HOME : GR : FOR C = 1 TO 1E +
     9: VTAB 21: PRINT "COLOR= "D
    %" ","X= "X" ","Y= "Y" ":Z =
     PEEK ( - 16384) - 128: POKE
     - 16368,0:X = X - (Z = 74):
    X = X + (Z = 75):Y = Y + (Z =
    77):Y = Y - (Z = 73):D% =  PDL
    (0) / 255 * 15: COLOR= 15: PLOT
    X,Y: FOR P = 1 TO 99: NEXT :
     COLOR= D%: PLOT X,Y: NEXT

                         I
Draw by using the  J K keys and
                         M

change colors by rotating Paddle 0.
```

Listing 8.

```
10  REM    FLOWERBURST
20  REM    A ONE-LINER
30  REM    BY IVAN ROUS
40  REM
50  HGR2 : FOR D = 1 TO 5:X1 =  RND
     (1) * 189 + 45:Y1 =  RND (1)
      * 100 + 45:R =  RND (1) * 1
     0 + 33: HPLOT X1 + R,Y1:C =
      INT ( RND (1) * 20) + 4: HCOLOR=
     C / 4: FOR Z = 0 TO 6.28 STEP
      .0157:J =  COS (Z * C) * R:X
      =  COS (Z) * J * 1.217:Y =
      SIN (Z) * J: HPLOT  TO X1 +
     X,Y1 + Y: NEXT Z,D: GOTO 50
```

SAVE
RADIO SHACK
TRS-80's™
We offer Special Discounts, Free Shipping and a Toll Free Order Number
1-800-531-7466 TOLL FREE
Pan American Electronics
Dept. P.E. - 1117 Conway Avenue
Mission, Texas 78572
(512) 581-2766 Telex 767339
CIRCLE 264 ON READER SERVICE CARD

ATARI®
Entertainer Kit 88.00
Programmer Kit 56.00
Communicator Kit . 345.00
Microsoft Basic 72.00
Atari 800 16K 735.00
Atari 400 16K 359.00
Atari 410 Cassette 80.00
Atari 810 Disk .. 480.00
ALL ATARI SOFTWARE 20% OFF
Plus Loads of 3rd Party Software!
VOTRAX TYPE'N'TALK: 340.00
ALSO EPSON & CENTRONICS PRINTERS
ZENITH & TELEVIDEO TERMINALS
BBI Mail Order is a company made up of computer professionals. We are able to provide low prices as well as technical support. Give us a call and find out why we consider the Atari the best home computer on the market today. You won't be disapointed.
BBI Mail Order
Specializing in Atari Home Computers
P.O. Box 365
Newton Highlands, MA 02161
(617) 964-3080
CIRCLE 123 ON READER SERVICE CARD

MEMOREX
FLEXIBLE DISCS
WE WILL NOT BE UNDERSOLD!! Call Free (800)235-4137 for prices and information. Dealer inquiries invited and C.O.D.'s accepted.
VISA
PACIFIC EXCHANGES
100 Foothill Blvd.
San Luis Obispo, CA 93401 In Cal. call (800)592-5935 or (805)543-1037
CIRCLE 262 ON READER SERVICE CARD

One Pagers

Some of the contributions are not programs in one line, but will fit in one page on the CRT screen. Listings 9 and 10 were sent by Ron Picardi. They are the same program done in Integer Basic and Applesoft, respectively. I had to do some digging to find out what the call to -12288 did. It is a call to the lo-res graphics routine. Line 5 and the call in line 10 can be replaced with GR. These programs illustrate some of the differences needed to do the same program in either of the Apple Basic languages.

One additional graphics program is shown in Listing 11. Jim Horning sent this program which appears to have been printed on a Silentype printer. Using odd numbers for N creates a circle pattern in the center. Even numbers cross through the center.

Questions-'N-Answers

Some interesting questions have been asked recently. I would like to share my responses to some of them.

About Disks

Using a modified design of a standard Shugart Associates drive, Apple has made it possible for us to use any good-quality 5 1/4" disk. Standard drives use at least the index hole for soft-sectored systems. In hard-sectored systems, there is an index hole and as many other holes as there are sectors.

Apple uses a system of pulses to mark the beginning of a track, so the index hole is not used. In fact, the index sensor has been removed (as have the head-load solenoid and the track zero sensor). Because index and sector holes are not required in the Apple Disk II system, you can use any disk.

And a reminder too about storing programs on both sides of disks. In a single sided system the head mechanism is not designed for rerecording on both sides. A felt head-load pad is used to force the disk against the head. This head-load pad collects dirt and becomes abrasive.

Also, when you turn the disk over it must spin in the opposite direction. Any dirt collected by the liner now comes loose and passes under the head to the other side of the disk. With the abrasive head-load pad rubbing on both sides of a disk, you could be asking for trouble. The other side of single sided disks is not certified either. Modern technology is such that you will find the second side good most of the time. But, it is not guaranteed.

Listing 9.

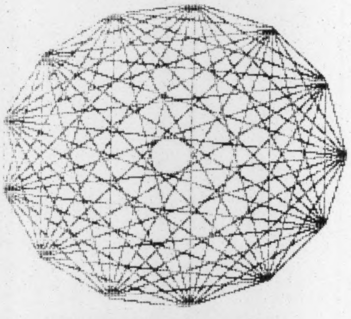
```
  1 REM  TWINKLING STARS
  5 CALL -936
 10 CALL -12288: DIM N( 400 ): FOR
    A=1 TO 400 STEP 2:N( A )= RND
    ( 8192 )+8193:N( A+1 )= RND ( 255
     )/64: NEXT A
 20 FOR A=1 TO 400 STEP 2:B= RND
    ( 2 ): IF B=1 THEN POKE N( A ),
    N( A+1 ): IF B=0 THEN POKE N(
    A ),0: NEXT A: GOTO 20
```

Listing 10.

```
0   REM  TWINKLING STARS
10   DIM N%( 400 ): FOR A = 1 TO 400
       STEP 2:N%( A ) =  INT (  RND (
     1 ) * 8192 + 8193 ):N%( A + 1 ) =
       INT (  RND ( 1 ) * ( 255 / 64 ))
     : NEXT : HGR
20   FOR A = 1 TO 400 STEP 2:B =  INT
      (  RND ( 1 ) * 2 ): IF B = 1 THEN
      POKE N%( A ),N%( A + 1 ): NEXT
     : GOTO 20
30   POKE N%( A ),0: NEXT : GOTO 20

]REM APPLESOFT RUNS MUCH SLOWER
```

Listing 11.

```
5   REM    ** BY JIM HORNING **
6   REM
10   HOME : DIM X(30),Y(30)
100   HGR2 : HCOLOR= 7:N =  INT ( RND
     (1) * 14 + 7):PI = 6.28318 /
     N
120   FOR I = 0 TO N - 1:Z = PI *
     I:X(I) =  COS (Z) * 107 + 14
     0:Y(I) =  SIN (Z) * 95 + 96:
      NEXT
170   FOR I = 0 TO N - 1: FOR M =
     I TO N - 1: HPLOT X(I),Y(I) TO
     X(M),Y(M): NEXT : NEXT : FOR
     T = 1 TO 1000: NEXT : GOTO 1
     00
```



Sample Run of graphics program by Jim Horning.

About Assembly Language

Most of the questions I get are about how to do specific things in assembly language. One of the recent questions asked how to generate a random number. Because Applesoft has a random number function, the code used in Applesoft can also be used for assembly language. The problem is to locate the addresses for the code in the Applesoft interpreter. But first, let me digress to provide some background information.

Assembly language as I know it requires the use of 6502 operation codes (opcodes) and related mnemonics. Mnemonics are the three letter codes assigned to each of the 55 opcodes of the 6502. See pages 118 thru 128 of the Apple II Reference Manual for a complete summary of 6502 opcodes and instructions.

The opcodes are the codes used by the 6502 internal microcode to perform various functions in machine language. Machine language is the result of assembling—at some memory location—the assembly language mnemonics (opcodes) and the operands. Operands are the addresses or data used with the opcodes to define each function to be performed.

If you examine a listing from the Apple disassembler, you can understand all these words much better. Figure 1 is an example of such a listing. A more detailed tutorial about assembly language was included in the May '80 column.

There are many good books and sources of information about 6502 assembly language. Among them are *Apple Machine Language* by Inman and Inman, *6502 Software Design* by Scanlon, and *Apple Assembly Line*. This last one is a newsletter available from S-C Software, P.O. Box 280300, Dallas, TX 75228. Subscriptions in the U.S. are $15 per year.

My favorite 6502 assembler is also available through this source. If you choose the newsletter, be sure to get all the back issues. There are many other 6502 books on the market; some are very good. Which ones you choose depends on your specific requirements. The answer to the random number question was found in the first issue of *Apple Orchard* the magazine of the International Apple Corps. (I understand that copies are still available.)

Random Numbers

Pages 12 thru 18 of the Mar/Apr 1980 IAC magazine include the Applesoft internal entry points. Since it was published, some errors have been found, but for our use there is no problem. First, look at the program in Figure 1. You will see the steps used to generate and display the random number. Function RND is located at address $EFAE. Remember that the $ symbol means Hex in 6502 assembly language.

In my attempts to make random numbers, I found that I could not call RND directly. The program worked for me when the RND function and the output display were called separately.

Two other routines are needed to get the random number on the screen. First you find that the output of RND is stored in memory locations called the Floating Point Accumulator (FAC). Next, you determine that you need to get FAC into a location called FBUFFER. FOUT is the routine that does this in the form of a string.

Once you have FAC in FBUFFER you can print the string on the screen using a routine called STROUT. From the program in Figure 1, you can see operands representing the addresses of these routines. Once you know where these programs are, you can examine them in detail.

For instance, if you want to use the string of numbers in FBUFFER for your own program, you can find the area of memory by reading the code for the STROUT routine. I would expect to find an indexing routine pointing to a table in memory.

New Hardware

If you want to add another drive to your system, it is easy to do with an adapter kit. Depending on what you have available, the cost of adapting varies from $60 to $320. If you have a Shugart SA 400 (or 400L) drive, the cost is lowest. A matching case is $20 more. By changing the drive select block, changing the terminator pack, adding four wires, and plugging in the adapter board, you have an Apple compatible disk drive. You can buy the drive modified or unmodified. Because of added power supply requirements, only 1 SA400 is recommended for each system. This means you can have a standard Apple and one modified unit. To connect more units, use an external power supply. The kits are available from RJ Electronics Laboratory, Box 186, Naperville, IL 60566. (312) 393-4385. ☐

```
                Machine          Assembly
                Language         Language
*300L
0300-      20 07 03       JSR     $0307   Operands
0303-      20 0B 03       JSR     $030B
0306-      60             RTS
0307-      20 AE EF       JSR     $EFAE   — Call RND Function to FAC
030A-      60             RTS
030B-      20 34 ED       JSR     $ED34   — Put FAC as string in FBUFFER
030E-      20 3A DB       JSR     $DB3A   — Print the string in FBUFFER
0311-      60             RTS
MEMORY          OPCODES         Mnemonic
ADDRESS                         Instructions
RELATES TO
OPCODE     *300G
           .4140625
           *300G
           .36371932
           *300G
           .0736757227
           *300G
           .674532106
           *300G
           .904458937
```

Figure 1. Sample program and example RUN to generate and display random numbers from machine language. Applesoft routines used are:

EFAE = RND
ED34 = FOUT
DB3A = STROUT

Micro-Systems announces

22 ways to make your VIC-20 get serious

VIC-20① The Wonder Computer of the 1980's. Less than $300. One heckuva lot of fun. But if you're using your VIC-20 strictly for recreation and fun, we at Micro-Systems think you're not getting your money's worth. Because we've designed the Micro-Systems IEEE-488 Cartridge which allows you to interface VIC and CBM 64 to all existing Commodore IEEE peripherals (8050, 4040, 2031, and printers). In addition, we've designed the RS-232 Interface board to allow the VIC-20 and CBM 64 to communicate with various serial devices such as printers, modems, and other systems—**NOT JUST A BUFFER DRIVER.** Also available is Micro-Systems Modem for the VIC-20 and CBM 64 which allows your computer to utilize auto-dial and auto-answer control over the communication process. If you need to access more than one cartridge in your VIC-20 expansion port, we have the solution. The V-Expander is now available with 3 or 6 additional expansion ports. The 6-slot V-Expander is switch selectable.

Available from Micro-Systems

VIC-20 Color Computer	$259.00
Commodore 64 Computer	$575.00
VIC-1540 Single Disk Drive	$499.00
VIC-1515 Graphic Printer	$325.00
VIC Modem	$129.00
VIE Cartridge (IEEE-488)	$ 79.95
CIE Cartridge (IEEE-488)	$ 99.95
V-232 RS-232 Interface	$ 45.00
VIC-1210 3K Expansion	$ 35.00
V8K Ram Expansion	$ 49.95
V16K Ram Expansion	$ 95.00

V24K Ram Expansion	$149.00
V-Expander (3-slot)	$ 49.95
V-Expander (6-slot)	$ 85.00
Joy Stick (Arcade Quality)	$ 29.95

Software

V-TERCOM Terminal Communicator program

Cassette	$ 10.00
Diskette	$ 15.00

Super Expander	$ 65.00
Programmers Aid Cartridge	$ 55.00
VICMON Machine Language Monitor	$ 55.00
Introduction to Basic Programming	$24.95
Introduction to Computing	$24.95
Programmable Character/Set Game-Graphics Editor	$ 14.95
VIC-20 Programmers Reference Guide	$ 15.95

IMMEDIATE DELIVERY

Yes, Please send me:

QTY.	MODEL#	NAME	PRICE
TOTAL	(In Texas, add 5% sales tax)		

Your Name
Address
City State Zip
payment method: Check ☐ Card-Exp. Date
Master Card #
Visa #
American Express #
Signature

①Registered Trademark of Commodore Int

Micro-Systems • 2554 Southwell • Dallas, Texas 75229 • (214) 484-7836

CIRCLE 238 ON READER SERVICE CARD

outpost: atari

John Anderson

It's getting to be the holiday season here at the outpost, and visions of hardware, software, and peripheral *sugarplums* are surely dancing in our heads.

As a service to our readers with extremely clear specifications to Santa regarding items for placement under the tree, Figure 1 is presented. Simply fill in the blanks, and leave the magazine in an obvious spot, conspicuously open to this page. The bathroom offers an inescapable point of sale, but be creative. (Warning: those desiring software may avoid last-minute disappointment by underscoring to loved ones the fragility of diskettes. Sure, you can stuff stockings in your boots, but you won't be able to boot disks that have been stuffed in your stocking.)

Self-Modifying Programs

Original Atari Basic has its strong and weak points, as do all computer languages. Because Atari Basic is a somewhat renegade dialect, however (as opposed to the orthodoxy of Microsoft Basic), it is subject to especially intense scrutiny. Those who dislike it tend to detest it; even those who like it tend toward ambivalence. C'est la langue.

There is at least one good reason why Atari Basic is a "splinter language." It was designed in tandem with and in order to squeeze the most from the Atari operating system. And as such, it is capable of some exotic tricks—that much is undeniable.

One of these tricks is the ability to write-code that in turn rewrites itself. Imagine the possibilities.

The Atari has a very open-minded operating system. It will allow the screen editor to operate from sources other than a human at the keyboard. The editor will go so far as to accept data pushed to the screen from Atari Basic, and Atari Basic can then execute commands directly from the screen editor.

Figure 2 is a short example of how this feature can work. First we clear the screen, and position the cursor. Then we straightforwardly print code lines to the screen. These lines will act as if the Atari has automatically pushed the RETURN key over them, thus incorporating them into the program (and eliminating any previous lines with the same line numbers). Notice the inclusion of a CONTinue command. You must print this command at the bottom of any list of modifications or the program will terminate before modification takes place. The program run must actually stop, accept the new data, and start itself again.

The trickiest facet of the technique is placement of the cursor. If you position it incorrectly, you can lose modifications, or get locked into a loop. A bit of experimentation will lead to successful results.

Only now is the potential of this capability being fully explored. Two new programs from Artworx Software make use of the technique: *Drawpic* saves four color user drawings in graphics modes 3 through 7, by saving modified strings; *Player/Missile Editor* does the same for player/missile shape tables. You can get more information concerning these programs from Artworx, 150 North Main Street, Fairport, NY 14450.

A hint on how you might simply utilize the technique in your own programs is shown in Figure 3. Here the user is asked to input data, which is then incorporated into the modified program. This program can then be saved, thus saving the input information.

I've used the simplest possible approach in this example, saving up to one hundred phone numbers as REM statements. You might wish to improve radically on this approach.

Another use of the technique would be to delete lines when they are no

Figure 1.

To Whom It May Concern (That Means You)

Let's face facts. Your ____________ (relationship), usually known as ____________ (name), has been reading *Creative Computing* non-stop for weeks now. The bug has bitten, the hook is in. It's hopeless, the addiction has been fostered. Things could be worse, right? As hobbies go, microcomputing fares pretty well. Maybe the time has come for you to acknowledge this.

Make a hit this ____________ (holiday). Get ____________ (product). It is available at ____________ (source), ____________ (address), at a cost of $ ____________ (dineros).

Otherwise, ____________ (name) will probably sulk through the whole holiday. Sound like extortion? Not at all. But don't chance it.

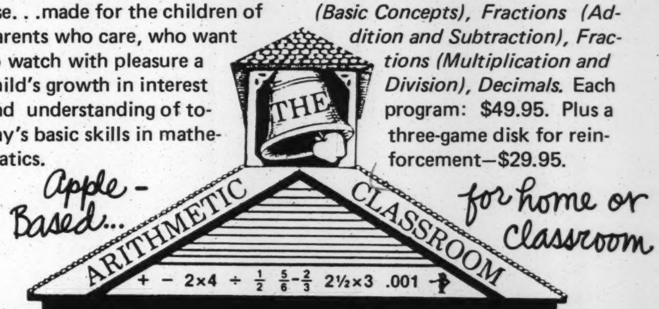
SWIFT LEARNINGWARE™

"**Boy, am I excited!**. . .I have finally seen a program for microcomputers that is really worth something." "I was ecstatic to find that somebody is creating quality educational software." ". . .an outstanding *user manual* which presupposes no prior knowledge of computers." Those are some of the words *Creative Computing* magazine used to describe Swift's **Elementary Mathematics Classroom Learning System.**

THEY APPLY EQUALLY TO SWIFT'S **ARITHMETIC CLASSROOM.**

Both are made to be the best elementary classroom learning programs available to the most forward-thinking schools. The **ARITHMETIC CLASSROOM** is also made to be the best arithmetic learning program for home use. . .made for the children of parents who care, who want to watch with pleasure a child's growth in interest and understanding of today's basic skills in mathematics.

The **Arithmetic Classroom** is the *unmanaged version* of its *Classroom Learning System* counterpart, and parents or schools can buy all or any one of the eight programs: *Addition, Subtraction, Multiplication, Division, Fractions (Basic Concepts), Fractions (Addition and Subtraction), Fractions (Multiplication and Division), Decimals.* Each program: $49.95. Plus a three-game disk for reinforcement—$29.95.



MORE FROM **SWIFT**

DIAL-A-COMMAND
Are you "into" Apple programming? If so, use D-A-C instead of thumbing through your manual. $9.95.

COMPUTER PROGRAMMING for KIDS and OTHER BEGINNERS is for 3rd graders or any beginner. Introduction to graphics. Three editions: Apple II, TRS-80 Model III, Radio Shack Color Computer. Each $9.95.

TEACHING COMPUTER PROGRAMMING to KIDS and OTHER BEGINNERS. Methods, activities, suggestions, plus *Be the Computer* simulation games. $9.95.

HOW TO PROGRAM IN BASIC
For Apple II, TRS-80, PET Commodore, TI-99/4A. Priced as sets (hands-on workbook and diskettes *or* cassettes)—$74.95.

STERLING SWIFT
PUBLISHING COMPANY
Hot Line (512) 444-7570
or write for catalog
1600 Fortview Road
Austin, Texas 78704

CIRCLE 337 ON READER SERVICE CARD

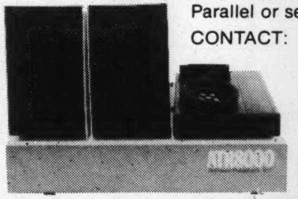
ATR8000: THE DOUBLE DENSITY DISK INTERFACE FOR THE ATARI® 800/400

The ATR8000 disk interface converts the ATARI 800/400 into a double density business machine . . . at an affordable price. The ATR8000:

- Comes with 16K RAM for disk and printer buffer memory. A 64K upgrade is available.
- Operates with standard 5¼" or 8" drives.
- Has a Z80 4MHz controller.
- Gives dual processor flexibility: Z80 or 6502.
- Comes standard with a serial or parallel port.
- Is software compatible with existing ATARI software.
- With the addition of OSA+ Version 4, the ATR8000 is a double density system that doubles disk storage capacity.
- Is CP/M compatible (with the 64K upgrade).

PRICING:			
ATR8000	$499.95	5¼" disk drive	$399.95
64K upgrade	-Call-	5¼" drive cable	$ 35.00
OSA+ Ver. 4	$ 49.95	8" drive cable	-Call-
		Parallel or serial printer cable	$29.00

CONTACT:



SOFTWARE PUBLISHERS, INC.
2500 E. Randol Mill Rd.
Suite 125
Arlington, TX 76011
(817) 469-1181

ATARI is a trademark of ATARI, Inc.
CP/M is a trademark of Digital Research, Inc.

CIRCLE 326 ON READER SERVICE CARD

COMPUTERS:

PERSONAL & BUSINESS

PRINTERS:

LETTER QUALITY & MATRIX

MONITORS:

GREEN PHOSPHOR & COLOR

SOFTWARE:

IBM, APPLE, ATARI, CP/M

BOOKS & SUPPLIES

COMPUTERTIME, INC.

P.O. BOX 216
KENTFIELD, CA. 94914
800-227-2520 TOLL FREE
IN CALIF. CALL
(415) 459-8082

CIRCLE 152 ON READER SERVICE CARD

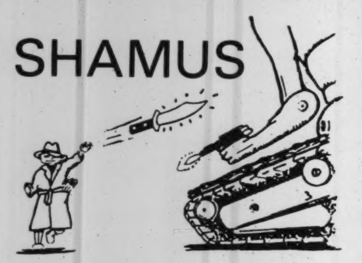
Royal Software

YOUR MARKETPLACE FOR:

* ATARI

WE DEAL EXCLUSIVELY IN PRODUCTS
FOR THE ATARI (THE BEST) COMPUTER

SHAMUS



32 Rooms with four levels of INTENSE arcade action with this game. Every room bristling with DANGER.

16K Disk or Tape $31.50

FROGGER

This is the genuine FROGGER game that you see in the arcades. Made by the same people that made Jawbreaker (One of the top ten sellers.)

32K Disk 16K Tape $31.40

Just like the arcade game that has been so popular. This is one of our BEST sellers for all ages.

$35.10 24K Disk **$39.90** 16K Cart.

HARDWARE

Prices listed with (*) are the CASH discount price, charge prices are higher.

800 Computer 16K	CALL
800 Computer 48K	CALL
400 Computer (used)	CALL
810 Disk Drive	$448
850 Interface	$178
410 Recorder	$ 78
16K Ram module	$ 69
32K Ram module	$ 97
Percom Disk Drive	$648
48K Ram module for 400	$197
WICO JOYSTICK	$ 26
Trac Ball controller	$ 63
800/400 Dust cover	$ 9
10 Blank Disks	$ 28
Mark II Modem	$ 99
Alien Group Synthesizer	$153
Epson MX-80FT/Plus	$588
Amdek Color 1 monitor	$387
12' Joystick Extension Cord	$ 10
Computer Paper 1000 8½x11	$ 17

Trade in your 400 for a NEW 800 Computer Call for details.

SOFTWARE

ZAXXON

Now you can get that powerful 3-D game for the Atari. Made by one of the BEST game makers Datasoft. Order early to get yours D $35.10

EASTERN FRONT

The MOST popular of all the APX programs and truly one of the best war games for the Atari. D,T $27.90

SAMMY THE SEA SERPENT

A must for the little computerists ages 4-7. The kiddies LOVE this one and "Sammy" too. Tape $15.90

BAJA BUGGY

If you have been waiting for a good Car racing game for the Atari then this is it! Disk or Tape $29.90

BUG ATTACK

You must defend your garden from hungry bugs. But, look out these bugs shoot back! Disk/Tape $26.90

FREE

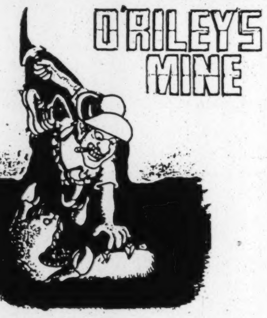
ATARI PRODUCTS CATALOG
with any order or
send $1.00 refundable with order.

METEOR STORM

The city is about to be destroyed and ONLY you can save its people from destruction. FAST, arcade type action game.

16K Disk or Tape **$29.95**

16K Disk or Tape $31.50



A SUPER graphic game in which you are the miner and must watch out for mine flooding and monsters of the deep.

CROSSFIRE

The aliens have landed and it's your job to save the city. (If you can!) TOP RATE GAME, ARCADE QUALITY, HI-RES Graphics & Sound.

16K TAPE
32K DISK
$26.90

VISA® master charge

TO ORDER CALL (503) 683-5361

HOW TO ORDER: Send check or money order or phone your order using your charge card. Ask about our 48 hour delivery service. Shipping on programs is $2.00 per order in USA or $3.90 for the 48 hour AIR service. Call for Hardware shipping costs. Prices subject to price change without notice.

Store Hours
8 am – 6 pm
Mon. – Sat.

Royal Software
2160 West 11th Ave., Eugene, Oregon 97402

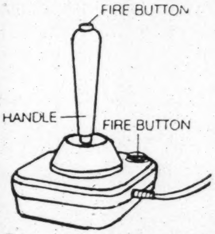
Royal Software

YOUR MARKETPLACE FOR:

*ATARI

WE DEAL EXCLUSIVELY IN PRODUCTS FOR THE ATARI (THE BEST) COMPUTER

WICO JOYSTICK



NEW FOR ATARI

$26.90

The ultimate in a one handed controller. The bat handle grip fits comfortably in your hand and offers smooth, quick movement. Two fire buttons, one on the handle, and the other on the base.

Descend through mazes into the Dungeons with your squadron of warriors to battle with visible and invisible monsters.

Wizard of Wor

$39.90 16K Cartridge
$35.10 24K Disk

PERSONAL FINANCE

and record keeping

This package can be used for home or a small business. A general ledger which allows you to set up data bases to match your own needs. Much more versatile than other packages we've seen. You have the ability to add categories as conditions change. You can produce reports at any time, which can cover any month or year-to-date and may be formatted to your desires. This system also has graph charts for display of up to ten items and color bar charts. Automatic scaling and labeling is included for the graphs. The 60 category data base should be sufficient for most purposes.

32K DISK **$67.50**

AIRSTRIKE

This is the one you've been reading about. NOW available. Like a most popular arcade game. D/T $35.10

De Re Atari

This manual is a favorite among the serious programmers. Learn the many secrets of the Atari. $17.90

STAR RAIDERS

The all time classic space game for the Atari. No other computer can even copy this one. Cart. $38.20

MATCH RACER

Drive your racer around rocks and other obstacles. 4 levels of play and a scrolling screen. D,T $26.90

WIZARD & the PRINCESS

A terrific HI-RES graphics adventure that is one of the best for the Atari 40K Disk $29.90

POOL 1.5

A real time pool simulation that is truly amazing in it's graphics. One you'll want to show your friends. $31.40 Disk $36.90 Cart.

ALI BABA

A Hi-Res graphic adventure game with up to 17 players. A real favorite with Lg. groups. Disk $28.90

THRESHOLD

Superb graphics makes this one of the BEST space games for the Atari Fast paced and arcade quality make this a must. 40K Disk $35.10

PAGE 6

Finally! A powerful hands on tutorial for beginning assembly language programmers. Packed full with 12 routines, source code listings and 40 page manual. Disk 24K $26.90

LETTER PERFECT

The BEST word processor on the Atari that we've found. File merge right justify, block movement, auto page numbering, underlining, headers & footers, superscripts and much, much more! D$133 Cart. $175.00

HUNDREDS OF ITEMS IN OUR CATALOG

CHOPLIFTER

48K DISK

$31.50

The smash hit game on the Apple is now available on the Atari. SENSATIONAL 3-D graphics make this one of the most exciting games for the Atari.

GHOST ENCOUNTERS

$26.90

16K TAPE OR DISK

You, as a ghost, travel through a network of 30 rooms in search of valuable prizes while, at the same time, try to survive the many perils that await you.

Mail Manager

MAIL MANAGER is a SUPERIOR mailing list and telephone number utility program. The display and ease of use is superior to any program we've seen. The versatility is unmatched by any we've tried. Novice users will be delighted with the excellent on-screen prompts and ease of use. The many features include: Search mode; Sort mode; Create subfiles; Add to existing file: Delete files; Edit records; View records; Print records; Print file copy and more!!

If you're looking for a strong and versatile mailing list program then we highly recommend this one to meet your needs.

24K DISK **$34.95**

Order Form

name ____________________

address ____________________

city ________ state ________ zip ________

Card # ____________________ Expire ________

Phone # (______) ____________________

Item Tape/Disk/Book Price Postage $2.00 minimum ______

Total ______

☐ CHECK ☐ VISA

☐ MASTERCARD

Royal Software,
2160 W. 11th Ave.
Eugene, Oregon 97402
CALL 503-683-5361

FREE

ATARI PRODUCTS CATALOG with any order or send $1.00 refundable with order.

CIRCLE 302 ON READER SERVICE CARD

```
10 REM SELF-MODIFYING EXAMPLE
20 GRAPHICS 0:POSITION 2,5:REM CLEAR SCREEN AND POSITION CURSOR.
   Y COORDINATE = NUMBER OF LINES TO CHANGE (5)
30 ? 110;" . THESE ARE THE LINES"
40 ? 120;" . THAT WILL REPLACE"
50 ? 130;" . THE LINES AT THE"
60 ? 140;" . END OF THE PROGRAM."
70 ? 150;" . NOTE ABBREVIATIONS REMAIN             ACCEPTABLE."
80 ? "CONT:REM THIS STATEMENT IS CRUCIAL, AND MUST NOT BE NUMBERED."
90 POSITION 2,0:REM REPOSITION CURSOR AT TOP OF SCREEN
100 POKE 842,13:STOP :REM DON'T PUT ADDITIONAL COMMANDS ON THIS LINE
105 POKE 842,12:REM POKES HALT PROGRAM, ENABLE EDITOR, ACCEPT COMMANDS,
    RETURN TO PROGRAM
110 REM WATCH THESE LINES CHANGE
120 REM TO THE LINES STIPULATED
130 REM IN LINES 30 THROUGH 70.
140 REM DON'T FORGET THE "CONT"
150 REM COMMAND AFTER LINE CHANGES!
```

Figure 2.

longer needed. Line numbers devoted to user input of variables, for example, could be deleted after the variable table has been constructed. This would help conserve memory.

Countless other applications await *your* entry into Atari behavior modification. The limits are set by your imagination only.

Souping Your Machine

Although the Atari does most things well, you can now customize it to do things better. The idea may seem to you akin to putting slicks on a BMW, but let me tell you about a few products we've tested that can make your machine faster and more versatile.

The *Fastchip,* from Newell Industries, replaces the floating point chip on the operating system board. Floating point routines, which involve mathematical operations with real numbers as well as integers, run extremely slowly on a standard Atari. Newell Industries claims that execution of these routines is boosted to three times the original rate.

I played *Hail To the Chief* twice on the same machine, once with the original chip, and once with *Fastchip.* Calculations within the program involve lengthy breaks in the action. *Fastchip* cut the waiting at least in half, from a maximum of 11 seconds to a maximum of about 5 seconds. It may not sound like much of a difference, but when you're waiting it is.

If you are into floating point routines and don't have a lot of time, *Fastchip* will help. It lists for $39.95, and installation in an Atari *800* takes less than five minutes. For more information, contact Newell Industries, 3340 Nottingham Lane, Plano, TX 75074.

You should resist with all your strength the temptation to confuse *Fastchip* with *Fast Chip,* the disk drive upgrade chip from Binary Corporation. This product will interest Atari owners with original 810 disk drives, as it provides a disk format 30% faster than the original. The company claims that the custom chip is 10% faster than even the new Atari upgrade chip.

It took about a half an hour for me to perform the upgrade, and was a bit more involved than I had initially anticipated. Still, the instructions are clear, and the process is broken into logical steps.

Binary Fast Chip without a doubt provides a faster format for your disks. I found that it cut about twenty seconds off the load time of a 12K file. But the disks are also rather sensitive —cases arose wherein *Fast Chip*-formatted disks took much *longer* to read or write. This was without exception true with disks for use with *Valforth.* It might therefore be advisable to wait until you have two drives, then install a *Fast Chip* in one. You can then choose the format to match the application.

The product lists for $39.95. For more information, contact Binary Corporation, 3237 Woodward Ave., Berkley, MI 48072.

Perhaps you've wondered if ROM cartridges could be copied to disk. Well they can now, with the *Block* from Protronics. The *Block* allows you to transfer from a ROM to a binary disk file. Up to ten ROM cartridges can be saved to a single disk. I was unable to find anything that the *Block* couldn't copy.

Potential pirates should take note: the *Block* itself is a ROM cartridge, and no cartridge file will run unless the *Block* is installed.

The *Block* lists for $99.95. For more information, contact Protronics, 17537 Chatsworth, Granada Hills, CA 91344.

The Library Grows

I remember, in the dim recesses of my mind, a time when information about the Atari was an extremely rare commodity. This was in ancient times, of course: maybe a year and a half ago. Now it seems a new book about the Atari arrives here every week. These are six of the best:

Atari Games and Recreations, by Herb Kohl, Ted Kahn, Len Lindsay, and Pat Cleland, Reston Publishing, Reston, VA 22090. Excellent starter for novices and kids, with an emphasis on fun programs the user can type in, play, and understand. Includes some nifty appendices.

Atari Sound and Graphics, by Herb Moore, Judy Lower, and Bob Albrecht, John Wiley and Sons, 605 Third Avenue, New York, NY 10158. The authors pace the text so that new concepts are introduced at a rate that can be absorbed. Sound and graphics

Figure 3.

```
110 REM A PRACTICAL DEMONSTRATION
120 DIM A$(10),N$(20),P$(18)
130 GRAPHICS 0
140 ? "*************************"
150 ? "*                       *"
160 ? "*  TELEPHONE DIRECTORY  *"
170 ? "*                       *"
180 ? "*        (L)IST         *"
190 ? "*        (A)DD          *"
200 ? "*        (D)ELETE       *"
210 ? "*        (S)AVE         *"
220 ? "*                       *"
230 ? "*************************"
240 INPUT A$:TRAP 130
250 IF A$(1,1)="A" THEN 300
260 IF A$(1,1)="D" THEN 360
270 IF A$(1,1)="S" THEN SAVE "D:DIRECTORY":REM CASSETTE USERS "CSAVE"
280 LIST 1,100
290 ? "PRESS RETURN TO CONTINUE":INPUT A$:GOTO 130
300 ? "WHAT WILL BE THE LISTING NUMBER";:INPUT N
310 ? "NAME";:INPUT N$:? "PHONE NUMBER";:INPUT P$:TRAP 310
320 GRAPHICS 0:POSITION 2,2
330 ? N;" REM",N$;" ";P$:? "CONT"
340 POSITION 2,0:POKE 842,13:STOP
350 POKE 842,12:GOTO 130
360 ? "LISTING NUMBER TO DELETE";:INPUT N:TRAP 360
370 GRAPHICS 0:POSITION 2,2
380 ? N:? "CONT"
390 POSITION 2,0:POKE 842,13:STOP
400 POKE 842,12:GOTO 130
```

WIN $5,000 Plus Royalties!*

For the best Talking Game

For the Atari® or Apple®II+

Using the VOICE BOX™ Speech Synthesizer

VOICEBOX
SPEECH SYNTHESIZER
THE ALIEN GROUP
MADE IN NEW YORK CITY, USA
Speech Synthesizer for Atari

Now you can make your Atari® 400/800 or Apple® II games and other programs come alive with the VOICE BOX by the Alien Group — the first low-cost, smart speech synthesizer with unlimited vocabulary.

Add jokes to your programs. Insults. Compliments. Help messages. Stories. Alien voices. Animal roars. Have your computer talk to the fire department or police in emergencies. To kids. Or blind people. Teach touch typing with immediate spoken feedback. Or just about any other subject — the fun way. Or help a speech-impaired friend communicate . . . the possibilities are limitless.

The VOICE BOX plugs into your Atari's serial port. And talks directly through your TV set. Or into any Apple II slot. No power supply or special interfaces needed.

Just select from its simple screen menu. A dictionary with thousands of common words (on diskette or cassette) automatically translates your text into speech. It's that easy.

But don't let its friendliness fool you. The VOICE BOX has all 64 phonemes (basic sounds, like "ah") built in. So you can precisely create any word or sound you can imagine. And store it all on diskette or tape. Names or foreign language words, for example. Or wierd non-human languages.

Let me entertain you — The VOICE BOX is creative too. It will crack you and your friends up with non-stop random, grammatically correct sentences, using words you specify. It also has an amusing talking face with lip-sync animation — a real crowd-stopper. Best of all, you can call the VOICE BOX from any BASIC program and make your program really hum —literally!

Singing Apples? — Apple owners get all these capabilities too — as a plug-in card plus diskette. Or there's a deluxe version with the dictionary in ROM (no diskettes to bother with), speaker, and ability to "sing" (hey we're not making this up folks) in any key. (Both Apple versions require 32K or more. Applesoft and DOS 3.3).

Don't confuse the VOICE BOX with "dumb" speech synthesizers that can't learn new words. Or software-based ones with lower speech quality — and an annoying tendency to blank out the display when they talk. The VOICE BOX is a true breakthrough in speech synthesis. Small wonder thousands of Atari and Apple owners have already bought the VOICE BOX.

The VOICE BOX is available now at leading computer stores throughout the world. Or direct from the Alien Group, with 10-day money back guarantee if you're not completely satisfied.

VOICE BOX For Atari. $169.00
16K and 32K versions included
(Specify diskette or cassette).

VOICE BOX for Apple II.+ $139.00.
(Requires speaker.)

VOICE BOX for Apple II+. $215.00
(Includes dictionary in ROM and singing capability. Comes with speaker.)

Enclose check or money order, Visa or Mastercard #. Please include expiration date.

CHECK YOUR LOCAL COMPUTER STORE FOR TALKING "VOICE BOX" VERSIONS OF YOUR FAVORITE GAMES FROM LEADING GAME COMPANIES

*Win a $5,000 prize — plus royalties — for the best Atari 400/800 or Apple II+ game using the VOICE BOX. Deadline: May 30, 1983. Write for contest details.

Please mail to: The Alien Group, Department CC-5 , 27 W. 23 St., N.Y., N.Y. 10010
Or call in order to (212) 741-1770 **CIRCLE 107 ON READER SERVICE CARD**

Atari is a registered trademark of Atari Inc. Apple is a registered trademark of Apple Computer, Inc. VOICE BOX is trademark of the Alien Group are a motivating force with kids, but many hobbyists will want this one too.

The Atari Assembler, by Don Inman and Kurt Inman, Reston Publishing, Reston, VA 22090. Best beginners machine language book available for Atari owners. Assumes you have Basic and an editor/assembler. Assembly language is tough stuff, but authors manage to keep things fresh with humor and good examples.

Games for the Atari, by S. Roberts, W. Hofacker, 53 Redrock Lane, Pomona, CA 91766. Includes good examples of player/missile movement from Basic, priority detection, and patching from Basic to machine language subroutines. Includes ten games to be typed in, unfortunately without much explanation.

Picture This, by David D. Thornburg, Addison-Wesley, Reading, MA 01867. A kid's introduction to graphics through Atari Pilot. Excellent as a supplement to "Student Pilot," the reference guide supplied with the Pilot cartridge.

Your Atari Computer, by Lon Poole, Martin McNiff, and Steven Cook, Osborne McGraw-Hill, 630 Bancroft Way, Berkeley, CA 94710. It may have taken two and a half years, but there is finally a manual available which thoroughly documents the rudiments, as well as a number of advanced topics, concerning Atari personal computers.

Following a remarkably steady pace, the book progresses through beginning operation, getting started in Basic programming, and includes comprehensive chapters on the program recorder, disk drive, and printers.

The main body of the book deals with advanced Basic programming, and stands to serve the proficient Basic programmer as well as the novice.

Next the book focuses on the goodies. Graphics and sound are given a clear and thorough treatment — with a chapter devoted to advanced graphics techniques. Character set animation, display lists and player-missile graphics are explained simply and thoroughly, with examples helping to illuminate the way. Those of you (like myself) who need every last thing spelled out for you, are bound to benefit from this approach.

Later chapters examine sound routines and summarize Basic commands.

The book concludes with nine appendices, each of value to the Atari programmer. Finally we can turn to a single resource for an annotated list of error codes and their meanings, status and keyboard codes, memory usage charts, and a listing of important memory locations.

Your Atari Computer should be packed with each and every unit Atari ships, alongside or in lieu of current documentation. No Atari owner should be without it.

Scuttlebytes

In the November issue, we gave a phone number for a Sunnyvale bulletin board system called TEAM Atari. Begun by an Atari employee, the board is unfortunately no longer in service. Apparently some Atari execs felt it was inappropriate, which is too bad.

You might try Bay Area Atari at (408) 244-6229. Sorry if we caused any inconvenience, but it is tough to compile a BBS list that remains totally accurate for any length of time.

A question many people are asking concerns the new Atari *5200* video system: is it or isn't it a *400* without a keyboard? The answer: well, yes and no. It does have 6502, Antic, GTIA, and Pokey chips. It does run nearly identical ROM software. However, for reasons somewhat difficult to fathom, the *5200* has had enough changes made to ensure incompatibility with Atari computers. The most dramatic evidence of this is a redesigned game controller, which uses an analog input, in addition to a telephone-style keypad.

The advantages to a handheld keypad are obvious: the advantages of an analog joystick perhaps less so. A potentiometer-controlled stick allows for better control in games such as *Missile Command,* but a digital stick is faster in quick-turning games like *Pac-Man.* The *5200* controller ports are necessarily redesigned, as are the cartridges themselves. Whether this incompatibility is utterly surmountible remains to be seen, but it certainly would be a formidable task.

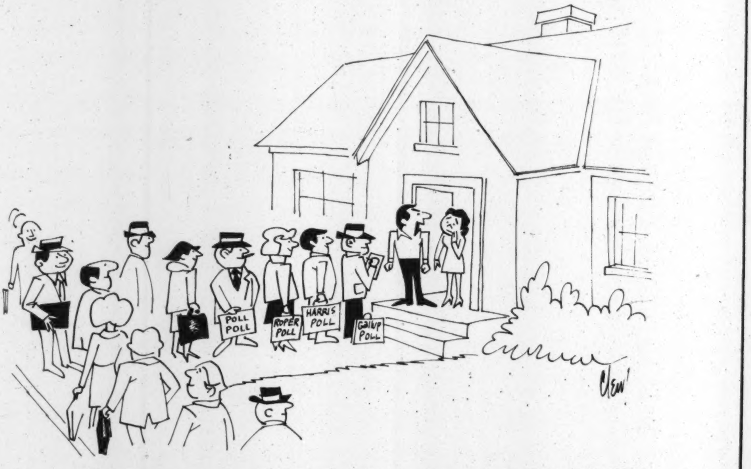
Another topic we hear a lot about is the "next generation" Atari. Have you heard about the Atari *600?* We have, although we haven't been able to confirm anything. It will be a single board computer, totally compatible with the *400* and *800.* It will have RS-232 capability built-in, and a full-stroke keyboard. It will come with 48K standard, and sport programmable function keys. We have even heard about an Atari *1000,* with a built-in dual density drive, and CP/M capability!

Smalltalk

What, you may ask, has become of Dave and Sandy Small? They are responsible for some of the most informative articles concerning the Atari that have ever appeared in any magazine. I first learned about player/missile graphics, display lists, redefinable character sets, and a half dozen other topics from their series of articles, which began in the June, 1981, issue of *Creative Computing.*

Well Dave was unhappy with the speed of the 810 disk drive, and so he did something about it: he designed his own. His system is aimed at professionals, and in addition to its many other capabilities, is about seven times faster than an 810 drive. If you'd like more information concerning the system, you can contact Dave at the Leading Edge, 8642A Spicewood Springs Road, P.O. Box 10998, Austin, TX 78766.

All of us at *Creative Computing* wish you the best this holiday season, and a happy, healthy new year. And to all a good night! ☐



"Some damn computer decided we are the average American family!"

1983 is just around the corner

The ACCOUNTANT

Finance Data Base System $129

Optional VisiCalc™ Interface $20

Allows you to define up to 63 codes. You'll save money when you prepare your taxes by having an accurate record of every legitimate tax deduction.

(800) 368-2022

Decision Support Software
1438 Ironwood Drive, McLean, VA 22101 (703) 241-8316

VisiCalc™ is a trademark of VisiCorp Inc

Apple Version circle 197 on Reader Service card
IBM Version circle 374 on Reader Service card

INVESTMENT ANALYSIS

New Software

How do you know when to be in Cash? Stocks? Mutual Funds? or Other Assets?

INVESTOR'S PATHWAY™ uses our sophisticated analysis to give buy and sell signals and selects individual stocks, precious metals, mutual funds or any other assets that have historic prices.
Price with manual **$179.00**

MARKET PATHWAY™ is an easy to use technical trading discipline which tells when the Dow, NYSE or any selected index turns bullish or bearish **$59.00**

Order now and purchase both for $199.00

Both programs are available for Apple II+, 48K RAM, APPLESOFT, 1 desk drive, DOS 3.3.

Send $3 (credited to your first purchase) for more information and sample outputs.

PATHWAY™ SOFTWARE
DIVISION OF TOWN PROPERTIES, INC.
Post Office Box 2006
Dept. CC12
Traverse City, MI 49685

Apple and Applesoft are registered trademarks of Apple Computer Inc.

CIRCLE 265 ON READER SERVICE CARD

PEEK & POKE
Software

✩ ATARI

	List	Our Price
Centipede (cart)	44.95	34.75
Deluxe Invaders (cart)	39.95	29.75
Gorf (cart)	49.95	36.95
Wizard of Wor (cart)	49.95	36.95
Deadly Duck (cart)	29.95	22.55
Temple of Apshai (D,C)	39.95	29.75
Deadline (D)	49.95	36.95
Ultima I (D)	39.95	29.75
Frogger (D,C)	34.95	26.25
3-D Supergraphics (D,C)	39.95	29.75
File Manager 800 (D)	99.95	71.95
Micropainter (D)	34.95	26.25
Text Wizard (D)	99.95	71.95
Le Stick (accs)	39.95	31.95

✩ IBM

Cyborg (D)	34.95	26.25
Warp Factor (D)	39.95	29.75
Deadline (D)	49.95	36.95
Zork I or II (D) ea	34.95	26.25
Stocks and Bonds (D)	25.00	18.95
T G Joysticks (accs)	64.95	47.75
Personal Investor (D)	145.00	108.75
Real Estate Analyzer (D)	250.00	187.55
Easy Writer II (d)	350.00	262.00
dBase II (D)	700.00	525.00

✩ CP/M

Spellbinder	495.00	275.00

Ashton-Tate, Micro Pro-More-Call-

✩ APPLE II

	List	Our Price
Arcade Machine (D)	59.95	44.25
Wizardry (D)	49.95	36.95
Knight of Diamonds (D)	34.95	26.25
Ultima II (D)	59.95	44.25
Zork I or II (D) ea	39.95	29.75
Deadline (D)	49.95	36.95
Frogger (D)	34.95	26.25
Choplifter (D)	34.95	26.25
Snooper Trooper I or II (D)	44.95	33.35
Kids & the Apple (Book)	19.95	15.35
PFS: (Improved) (D)	125.00	93.75

✩ APPLE ///

PFS: (Apple ///) (D)	175.00	131.00
Versa Form (D)	495.00	371.00
Data Manager ///	750.00	562.00

✩ TRS-80

Battle of Shiloh (C)	39.95	29.75
Sargon II (C)	29.95	22.55
Superscript (D)	50.00	36.95
MatheMagic (D)	89.95	64.95
Maxi Manager (D)	99.95	71.95

✩ VIC-20

Spiders of Mars (5K cart)	49.95	36.95
Alien Blitz (5K cass)	24.95	18.95
Meteor Run (5K cart)	49.95	36.95
Amok (5K cart)	39.95	29.75

Cert. Ck., M.O., Visa, M.C., (Incl. card # and exp. date), pers. ck. (add 2 wks). Shipping add $2.00.

Wyo. res. add 4%. Prices subject to change.

HI, AK and Canada shipping is $5.00 (U.S.)

Foreign Orders - 10% of merchandise total (in U.S. currency)

★ **FREE PRICE LIST**
$1.50 credit for calls on orders over $75.00

711 RANGER DRIVE
CHEYENNE, WY 82009
PHONE [307]635-1849

Apple, Atari, TRS-80, IBM and Visicalc are Registered Trademarks.

CIRCLE 266 ON READER SERVICE CARD

THE SPEED READER™

Read Faster! Understand More! 2 disks, 5 separate programs, 34 reading selections (grades 8 - adult)
IBM PC 64K **$74.95**

New Products

WORD ATTACK!

Learn new words with a fast-action arcade game; data files for grades 4 - 12 plus editor
Apple 48K **$44.95**

MATH BLASTER

Master math facts with a suspense-filled, high action, arcade game, editor included (grades 1 - 6)
Apple 48K **$44.95**

DAVIDSON & ASSOCIATES

6069 Groveoak Place #14-C, Rancho Palos Verdes, Ca. 90274
213/378-7826

Satisfaction Guaranteed! If you are not satisfied with a product, return it to us within 7 days for a full refund less handling charge.

CIRCLE 175 ON READER SERVICE CARD

The Graph Paper

Part 6: The Power

David Lubar

This is where the fun begins. That mysterious mid-memory chunk of hi-res graphics becomes clay which we can mold to fit any whim. I could ramble on about the great feeling derived from taking full control of the screen, but will avoid proselytizing and instead pass on an example. Granted, every programmer tends to preach his favorite language, be it Assembly, Forth, Pascal, or whatever; still, the following example should convince unbelievers that machine language is the only way to go.

Listing 1 shows a Basic program that fills the hi-res screen in sequence, with values from 0 to 255. Listing 2 does the same thing in machine language. I will discuss this second program in detail later. For now, try them both and savor the difference. Awesome, isn't it? O.K., I've vented my preaching for the month. From here on down I'll try to refrain.

This month's prize-winning question, from Chris Pedonesi, pretty much encompasses all the material covered below. He wants to know "how the memory in the hi-res graphics pages are related to the display, and how to use this information to draw shapes and characters on the screen directly." It will take more than one article to cover this topic, so let's get started.

Bit Maps

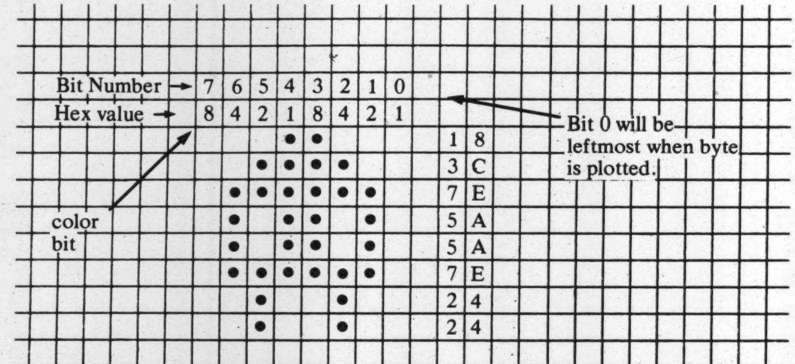
There are two components to hi-res graphics: the memory map and the bytes within the map. Once you understand these two things, you have it licked. The memory map for hi-res comprises locations $2000 to $3FFF. Whenever graphics is enabled, the video image produced by the Apple is based on the values found in this area.

The hi bit of each byte determines which color group to display for that byte. The remaining bits determine whether or not to plot a pixel. So each byte controls seven dots on the screen. These bits are displayed in what seems to be a backwards fashion.

The lowest bit of each byte plots the left-most pixel of the set, the highest plotting bit plots the rightmost pixel. The best way to see this is with an example. First, get into the monitor. From here, typing $C050 (return) $C054 (return) $C057 (return) will put up the graphics page.

(Weird happenings department: When you type in a memory location and press return, the Apple does two things. First, it reads and displays the value in that location. This is what toggles the soft switches to turn on graphics, etc. Second, it sets monitor pointers to the next mem-

Figure 1.



ory location. Pressing return again will produce a read and display of more bytes. This innocent feature can produce an annoying result. Let's say you typed $C050 (return) to set the graphics mode. If you next hit return again, the Apple will read $C051 and reset the text mode. Thus an innocent return can pop you into places you didn't expect. The quickest cure is to type 00 (return) after accessing graphics switches. This gets the monitor pointers safely away from the soft switches.)

Listing 1.

```
10  REM  PROGRAM TO FILL THE HI-R
     ES SCREEN
20  HGR
30  POKE 49234,0: REM  FULL SCREE
     N
40 FILL = 1
50  FOR I = 8192 TO 16383: POKE I
     ,FILL: NEXT I
60 FILL = FILL + 1: IF FILL > 256
     THEN FILL = 0
70  GOTO 50
```

Depending on what was in memory, you will be greeted with either a blank screen or some patterned or random display. To clear things up, the following trick is handy. Type 2000:00 (from here on, return is assumed unless otherwise noted). This puts the value $00 into location $2000. Now, we'll use the monitor MOVE command to trick the Apple into filling the rest of the screen area with that same $00.

The memory move feature of the monitor normally operates by taking each byte of the source and moving it to the destination. By placing the destination area within the source area, the Apple can be made to fill memory with any value. In this instance, the command is 2001< 2000.3FFEM.

You have just told the Apple to move into the area starting at location $2001 everything from $2000 to $3FFE. First, it takes the value from $2000 (which we set to $00) and places it in $2001. Next, it takes the value from $2001 and places it in $2002. Thus, the original value propagates throughout the desired range.

Anyhow, to see the way bytes are interpreted graphically, try placing different values in location $2000. Start with 2000:01. One pixel will light up. Change the number to $02. The pixel will move to the right. The hex values 01,02,04,08,10, 20,40 in sequence turn on each bit of the byte in order from left to right. Isolated bits are in color.

You will notice that as the pixel moves through its seven positions, the color alternates. Bits set at an odd coordinate produce one color, those on an even coordinate produce the other color. Any two bits in a row will be white. If the high bit is set (by adding $80 to the byte), the other color group will be produced.

To put up any specific pattern of seven bits, you merely change the pattern into ones and zeroes, then convert this binary value to hex. That's all there is to it.

Suppose you want a line of two colored bits at the leftmost part of the screen. Remembering that the lowest bit plots the leftmost pixel, and that solid color is obtained by alternate bits, the pattern would be 00000101 or $05. To get the other color set, use $85. For the other two colors, shift the pattern by one bit so it becomes 00001010 or $0C.

One of the problems you will encounter is due to the fact that 7 is an odd number (I'm not sure who discovered this profound mathematical tidbit). To get a graphic idea of what the problem is, enter the following 2000:01 01. This puts the value $01 into locations $2000 and $2001.

Notice that the two pixels are not the same color. Since the Apple displays one set of colors at even locations and another set at odd locations, and since there are seven bits plotted for each byte, as any byte is moved through screen memory, its bits alternate between having even and odd positions.

If you place $01 in location $2000, the set bit occurs at horizontal location 0. Move the byte to $2001 and the set bit lights up a pixel at location 7. Move to $2002 and the bit is even again and lighting up location 14. This won't affect us much right now, but will come into play a great deal as we progress.

The simplest graphic manipulations are those, such as Listing 1, which access the whole screen. In such cases, the screen can be treated as nothing more than an 8K block of memory. The next step is to access the screen in order, line by line. Unfortunately, memory order and screen order do not coincide. We'll explore that soon enough. For now, let's go through some simple manipulations.

Massive Changes

Listing 1 is a typical example of simple screen manipulation. It first sets up a

Listing 2.

```
:ASM
               * PROGRAM TO FILL THE
               * HI-RES SCREEN WITH
               * A SEQUENCE OF VALUES
               *
                         ORG  $6000
               BYTE      EQU  $F8
               DESTLO    EQU  $F9
               DESTHI    EQU  $FA
               *
               * INITIALIZE THE SCREEN
               *
6000: 8D 50 C0           STA  $C050   ;GRAPHICS MODE
6003: 8D 52 C0           STA  $C052   ;FULL SCREEN
6006: 8D 54 C0           STA  $C054   ;PAGE 1
6009: 8D 57 C0           STA  $C057   ;HI-RES
               *
               * SET UP POINTERS AND COUNTERS
               *
600C: A9 00              LDA  #$00    ;INITIALIZE VALUE THAT WILL
600E: 85 F8              STA  BYTE    ;BE STORED TO THE SCREEN
6010: A8                 TAY
6011: 85 F9              STA  DESTLO
6013: A9 20    LOOP      LDA  #$20
6015: 85 FA              STA  DESTHI  ;SET POINTER TO $2000
6017: AA                 TAX          ;X IS USED TO COUNT $20 PAGES
6018: A5 F8              LDA  BYTE    ;RESTORE DESIRED SCREEN BYTE
601A: 91 F9    LOOP1     STA  (DESTLO),Y
601C: C8                 INY
601D: D0 FB              BNE  LOOP1   ;DO ONE PAGE
601F: E6 FA              INC  DESTHI  ;POINT TO NEXT PAGE
6021: CA                 DEX         ;DECREASE COUNTER
6022: D0 F6              BNE  LOOP1   ;DO $20 PAGES
               *
               * SCREEN HAS BEEN FILLED.
               * *
6024: E6 F8              INC  BYTE    ;SET UP NEXT VALUE
6026: A9 FF              LDA  #$FF    ;DELAY A BIT
6028: 20 A8 FC           JSR  $FCA8   ;USING MONITOR ROUTINE
602B: AD 00 C0           LDA  $C000   ;CHECK FOR KEYPRESS
602E: 10 E3              BPL  LOOP    ;NO KEY
6030: 2C 10 C0           BIT  $C010   ;CLEAR KEYBOARD
6033: 8D 51 C0           STA  $C051   ;RESTCRE TEXT MODE
6036: 60                 RTS

--- END ASSEMBLY ---

TOTAL ERRORS: 0

55 BYTES GENERATED THIS ASSEMBLY
```

pointer to location $2000. I have used a few standard shortcuts in the code which are mostly a matter of preference rather than any hard and fast rules.

For example, LDY #$00 could have been used instead of TYA. But since the zero was already in the accumulator, the TYA operation saves space.

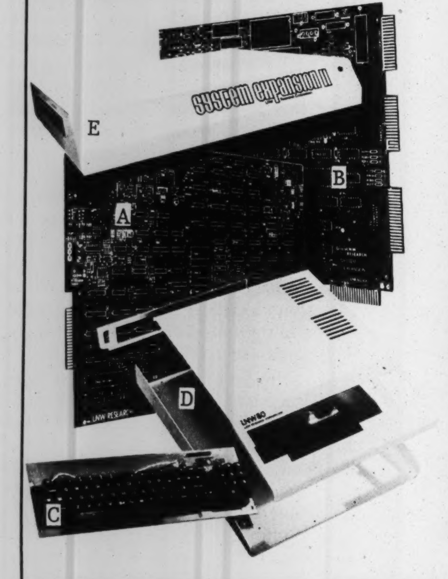
The use of the X register as a counter is another shortcut. In this case, I know I am dealing with $20 pages of memory, so it is convenient to move the $20 into X and use that register as a counter. Another method would be to check the hi byte of the pointer after each increment and stop when it reached $40.

Anyhow, working through one page (256 bytes) at a time, the program places a byte (initially zero) in screen memory. The command STA (DESTLO),Y is an example of indirection, a common technique that is used extensively in graphics. The memory location within the parentheses points to the actual location used by the operation.

At the start, DESTLO and DESTHI point to location $2000. The value in the Y register is added to this. If Y contains 5, the command operates on location $2005. In general, this method is very handy for stepping through a page of memory. The only drawback is that such commands are slower than those that do not use indirection. While a difference of one machine cycle is not crucial now, you will encounter cases in which the slight delay, compounded by a looping structure, might cause noticeable delays in a program.

Listing 3.

```
:ASM
                        * PROGRAM TO PRODUCE
                        * A 'NEGATIVE' SCREEN IMAGE
                        *
                                    ORG   $6000
                        DESTLO      EQU   $F8
                        DESTHI      EQU   $F9
                        *
6000: 8D 50 C0                      STA   $C050
6003: 8D 52 C0                      STA   $C052
6006: 8D 54 C0                      STA   $C054
6009: 8D 57 C0                      STA   $C057
600C: A9 00                         LDA   #$00
600E: A8                            TAY
600F: 85 F8                         STA   DESTLO
6011: A9 20                         LDA   #$20
6013: 85 F9                         STA   DESTHI
6015: AA                            TAX
6016: B1 F8             LOOP        LDA   (DESTLO),Y
6018: 49 FF                         EOR   #$FF
601A: 91 F8                         STA   (DESTLO),Y
601C: C8                            INY
601D: D0 F7                         BNE   LOOP
601F: E6 F9                         INC   DESTHI
6021: CA                            DEX
6022: D0 F2                         BNE   LOOP
6024: 60                            RTS

--- END ASSEMBLY ---

TOTAL ERRORS: 0

37 BYTES GENERATED THIS ASSEMBLY
```



COMPUTER KITS – FROM $69.95

LNW SEMI-KITS can save you hundreds of dollars. By obtaining your own parts at the lowest possible cost and assembling the **LNW SEMI-KITS**, you can have the most highly acclaimed microcomputer in the industry – the **LNW80**. The **LNW SEMI-KITS** are affordable modules. You can start with a modest cassette system and expand to a full 4Mhz TRS-80 compatible system with 5 or 8 inch double density disks and color at any time.

A. LNW80 CPU – Made of high quality FR4 glass epoxy double sided circuit material, with plated-through holes and gold edge connector. It is fully solder-masked and silk screened. Here are just some of the outstanding features you will have when your **LLNW80** CPU board is fully assembled: • 16K RAM • Color and black and white video • 480 x 192 high resolution graphics • 64 and 80 column video • 4 Mhz Z80A CPU • Upper and lower case display • 500 and 1000 baud cassette I/O –**$89.95**

B. SYSTEM EXPANSION – Expand the **LNW80** computer board, **TRS-80** and **PMC-80** computer with the following features: • 32K memory • Serial RS232C and 20Ma port • Real time clock • Parallel printer port • 5 inch single density disk controller • Expansion bus (screen printer port) • Onboard power supply • Solder-masked and silk screened legend – **$69.95** (tin plated contacts) – **$84.95** (gold plated contacts)

C. KEYBOARD – 74 key expanded professional keyboard – includes 12 key numeric keypad. Fully assembled and tested. – **$99.95**

D. COMPUTER CASE – This stylish instrument-quality solid steel case and hardware kit gives your **LNW80** that professional factory-built appearance. – **$84.95** Add $12.00 for shipping.

E. SYSTEM EXPANSION CASE – This stylish instrument-quality solid steel case and hardware kit gives your **SYSTEM EXPANSION** interface that professional factory-built appearance. – **$59.95** Add $10.00 for shipping.

F. LNW80 CPU – HARD TO FIND PARTS KIT – **$82.00**
G. LNW80 VIDEO – HARD TO FIND PARTS KIT – **$31.00**
H. SYSTEM EXPANSION – HARD TO FIND PARTS KIT – **$27.50**
I. LEVEL II ROM set. (6 chip set) – **$120.00**

VISA and **MasterCard** accepted. Add $3.00 for shipping plus $1.00 for each additional item. All shipments via UPS surface. Add $2.00 for U.S. Mail. Shipments outside continental U.S.: funds must be U.S. dollars. Sufficient shipping costs must be included with payment.

ORDERS & INFORMATION – (714) 544-5744
SERVICE – (714) 641-8850

LNW Research Corp.
2620 WALNUT Tustin, CA. 92680

CIRCLE 223 ON READER SERVICE CARD

While filling the screen is fun for a bit, it does seem to be a rather limited program. But it is a step in the right direction. With a slight modification, things become more interesting.

Rather than just store a value into each location, let's modify existing values. Put your favorite picture on the screen, then try the program in Listing 3. This one produces a "negative" of the screen image.

The basic setup is the same. The difference is that the program reads each screen byte, performs an exclusive or with $FF, then stores the result. By using various logical operations, you can produce different interesting effects. Since logical operations are one of the keys to graphics, it will be worthwhile to take a short sidetrip through the topic.

A Bit At A Time

The three logical operations, AND, ORA, and EOR, have a rather beautiful symmetry. Each can either change a bit in a certain way or leave it alone, depending on the values used. Rather than go through truth tables, let's look at the situation in a practical way.

There are three things you might want to do to a bit; force it to be 1, force it to be 0, or flip it (making 1 into 0 or 0 into 1). ORA can force a bit to be 1. Wherever there is a 1 in the operand, there will be a 1 in the results. Where there is a 0, there will be no effect.

Let's say you want to set the hi bit of each byte on the screen. This, plugged into Listing 3, would be done with ORA #$80 (remember that $80 is 10000000 in binary). The hi bit of each byte will be set to 1, no matter what it was before. The rest of the bits will be unchanged.

To force a 0, use AND. Any bit set to 0 in the operand will produce 0 in the results. A value of 1 leaves the result unchanged. Following the above example, we can set all the hi bits to 0 using AND #7F (again $7F is binary 01111111).

Finally, EOR is used to flip a bit. A 1 in the operand will flip a bit, a 0 has no result. So, the EOR #$FF in Listing 3 flips all the bits in each byte. If you wanted to flip everything except for the hi bit, you would use EOR #$7F.

Sometimes a combination of operations is necessary. If you wanted to produce a negative of the screen and set all hi bits to 0, you would use EOR #$FF followed by AND #$7F. Try some combinations on a picture and see if you can predict the results. What would AND #$0F do? What happens if you EOR a screen byte with itself?

Order, Please

Here comes the big one. The toughest obstacle to doing Apple graphics is that the screen is not mapped in contiguous fashion. The first 40 screen bytes occur normally enough in locations $2000 to $2027. But if you put a byte into $2028, it won't appear on the second line. Strange as it may seem, the address of the first byte of the second line is $2400. The third line starts with $2800.

I don't know the exact reason for this mapping, but it basically ties in with the video hardware and the fact that the screen has 40 bytes across and (another staggering mathematical discovery) 40 does not go evenly into 256. Anyhow, this is the mapping we have to live with.

The pattern is actually not that bizarre. Starting at $2000, each successive line is found by adding $400 (or adding $04 to the hi byte). After reaching $3C00, the sequence goes to $2080 and again begins adding $400. After $3C80 comes $2100. So far the pattern seems to be; add $400 for each successive line until the number becomes too large. Then add $80. Then go back to adding $400 again.

Listing 4.

```
6100-  20 24 28 2C 30 34 38 3C
6108-  20 24 28 2C 30 34 38 3C
6110-  21 25 29 2D 31 35 39 3D
6118-  21 25 29 2D 31 35 39 3D
6120-  22 26 2A 2E 32 36 3A 3E
6128-  22 26 2A 2E 32 36 3A 3E
6130-  23 27 2B 2F 33 37 3B 3F
6138-  23 27 2B 2F 33 37 3B 3F
6140-  20 24 28 2C 30 34 38 3C
6148-  20 24 28 2C 30 34 38 3C
6150-  21 25 29 2D 31 35 39 3D
6158-  21 25 29 2D 31 35 39 3D
6160-  22 26 2A 2E 32 36 3A 3E
6168-  22 26 2A 2E 32 36 3A 3E
6170-  23 27 2B 2F 33 37 3B 3F
6178-  23 27 2B 2F 33 37 3B 3F
6180-  20 24 28 2C 30 34 38 3C
6188-  20 24 28 2C 30 34 38 3C
6190-  21 25 29 2D 31 35 39 3D
6198-  21 25 29 2D 31 35 39 3D
61A0-  22 26 2A 2E 32 36 3A 3E
61A8-  22 26 2A 2E 32 36 3A 3E
61B0-  23 27 2B 2F 33 37 3B 3F  Hi bytes
61B8-  23 27 2B 2F 33 37 3B 3F
61C0-  00 00 00 00 00 00 00 00
61C8-  80 80 80 80 80 80 80 80  Lo bytes
61D0-  00 00 00 00 00 00 00 00
61D8-  80 80 80 80 80 80 80 80
61E0-  00 00 00 00 00 00 00 00
61E8-  80 80 80 80 80 80 80 80
61F0-  00 00 00 00 00 00 00 00
61F8-  80 80 80 80 80 80 80 80
6200-  28 28 28 28 28 28 28 28
6208-  A8 A8 A8 A8 A8 A8 A3 A8
6210-  28 28 28 28 28 28 28 28
6218-  A8 A8 A8 A8 A8 A8 A8 A8
6220-  28 28 28 28 28 28 28 28
6228-  A8 A8 A8 A8 A8 A8 A8 A8
6230-  28 28 28 28 28 28 28 28
6238-  A8 A8 A8 A8 A8 A8 A8 A8
6240-  50 50 50 50 50 50 50 50
6248-  D0 D0 D0 D0 D0 D0 D0 D0
6250-  50 50 50 50 50 50 50 50
6258-  D0 D0 D0 D0 D0 D0 D0 D0
6260-  50 50 50 50 50 50 50 50
6268-  D0 D0 D0 D0 D0 D0 D0 D0
6270-  50 50 50 50 50 50 50 50
6278-  D0 D0 D0 D0 D0 D0 D0 D0
```

Listing 5.

```
:ASM
                        * PROGRAM TO PRODUCE
                        * A 'NEGATIVE' SCREEN IMAGE
                        *
                                 ORG  $6000
                        DESTLO   EQU  $F8
                        DESTHI   EQU  $F9
                        TABHI    EQU  $6100
                        TABLO    EQU  $61C0
                        *
                        * NOTE: LOOKUP TABLE IS NOT INCLUDED
                        * IN THIS FILE. IT MUST BE
                        * BLOADED SEPARATELY.
                        *
                        *
6000: 8D 50 C0                   STA  $C050
6003: 8D 52 C0                   STA  $C052
6006: 8D 54 C0                   STA  $C054
6009: 8D 57 C0                   STA  $C057
600C: A2 00                      LDX  #$00    ;USE X TO INDEX TABLE
600E: BD C0 61          LOOP1    LDA  TABLO,X ;SET UP POINTERS
6011: 85 F8                      STA  DESTLO
6013: BD 00 61                   LDA  TABHI,X
6016: 85 F9                      STA  DESTHI
6018: A0 27                      LDY  #$27    ; PREPARE TO DO A LINE
601A: B1 F8             LOOP2    LDA  (DESTLO),Y ; GET SCREEN BYTE
601C: 49 FF                      EOR  #$FF    ;FLIP IT
601E: 91 F8                      STA  (DESTLO),Y ;PUT IT BACK
6020: 88                         DEY
6021: 10 F7                      BPL  LOOP2   ;REPEAT FORTY TIMES
6023: E8                         INX
6024: E0 C0                      CPX  #$C0    ;DO 192 LINES
6026: D0 E6                      BNE  LOOP1
6028: 60                         RTS

--- END ASSEMBLY ---

TOTAL ERRORS: 0

41 BYTES GENERATED THIS ASSEMBLY
```

Eventually, you will reach $3F80. The next number is $2028. The sequence now goes through $2428 and so on. Now the low bytes alternate between $28 and $A8. After this series taps out, the lo bytes become $50 and $D0. Finally, the last line starts at $3FD0.

If you have followed this pattern you might have noticed that there are 16 unused bytes on each page. These occur from $78 to $7F and $F8 to $FF for each page of hi-res memory.

In the old days, programmers used a calculation method to find the starting address of the line. The current method is to use a lookup table. This table contains the starting address of each line of the screen in order. The table requires 192 each for lo bytes and hi, or two entries for each line of the screen.

While it is a bit tedious to type in the table, it will be used in almost any graphics program you write. I would suggest saving a copy, either as a binary file or as a set of assembler data statements, then just patching it into future programs.

Rather than repeat the whole table in all programs that require it, I shall list it once here, and just refer to it in future programs. For a hex dump of the lookup table, see Listing 4.

Sequential access of the screen can be applied to Listing 3. Rather than change the picture in interleaved fashion, we can do it smoothly from top to bottom. Listing 5 shows the program.

The lookup table, combined with indirect addressing, allows us to access any part of the screen selectively. If you can access a specific area of the screen, and put what you want on that area, you are a good way toward full animation. Since there are a few additional concepts needed for smooth animation, let's stick with the byte level for the moment and look at character graphics.

Cast of Characters

As a first taste, get into the monitor, clear the screen, and type the sequence shown in Listing 6. In a slow fashion, you have just performed a feat of character graphics. That's all the computer does; it takes a series of bytes and puts them on the screen.

Listing 6.

```
2000:18
2400:3C
2800:7E
2C00:5A
3000:5A
3400:7E
3800:24
3C00:24
```

The bytes come from a shape table, but it is unlike an Applesoft shape table. The shape tables we will be using from now on are bit mapped images of the

Listing 7.

```
:ASM
                 * EXAMPLE OF SIMPLE
                 * CHARACTER GRAPHICS
                 *
                            ORG  $6000
                 DESTLO     EQU  $F8
                 DESTHI     EQU  $F9
                 XLOC       EQU  $FA
                 YLOC       EQU  $FB
                 OLDX       EQU  $FC
                 OLDY       EQU  $FD
                 OLDKEY     EQU  $FE
                 TEMP       EQU  $FF
                 TABHI      EQU  $6100
                 TABLO      EQU  $61C0
                 *
                 * NOTE: LOOKUP TABLE IS NOT INCLUDED
                 * IN THIS FILE. IT MUST BE
                 * BLOADED SEPARATELY.
                 *
                 * CLEAR SCREEN
                 *
6000: A9 20                 LDA  #$20
6002: 85 F9                 STA  DESTHI
6004: AA                    TAX
6005: A9 00                 LDA  #$00
6007: 85 F8                 STA  DESTLO
6009: A8                    TAY
600A: 91 F8      CLEAR      STA  (DESTLO),Y
600C: C8                    INY
600D: D0 FB                 BNE  CLEAR
600F: E6 F9                 INC  DESTHI
6011: CA                    DEX
6012: D0 F6                 BNE  CLEAR
                 *
                 * ENABLE GRAPHICS
                 *
6014: 8D 50 C0              STA  $C050
6017: 8D 52 C0              STA  $C052
601A: 8D 54 C0              STA  $C054
601D: 8D 57 C0              STA  $C057
                 *
                 * INITIALIZE VARIABLES
                 *
6020: A9 13                 LDA  #$13
6022: 85 FA                 STA  XLOC
6024: 85 FC                 STA  OLDX
6026: A9 60                 LDA  #$60
6028: 85 FB                 STA  YLOC
602A: 85 FD                 STA  OLDY
                 *
                 * ERASE/REDRAW CYCLE FOLLOWS.
                 * FIRST TIME THROUGH, ERASE COULD
                 * BE SKIPPED.
                 *
602C: A2 07      ERASE      LDX  #$07    ;SHAPE HAS 8 BYTES
602E: A4 FD                 LDY  OLDY    ;GET VERTICAL ADDRESS
6030: 84 FF                 STY  TEMP
6032: B9 C0 61   ERASE1     LDA  TABLO,Y ;SET UP POINTERS
6035: 85 F8                 STA  DESTLO
6037: B9 00 61              LDA  TABHI,Y
603A: 85 F9                 STA  DESTHI
603C: A9 00                 LDA  #$00
603E: A4 FC                 LDY  OLDX    ; GET HORIZONTAL LOCATION
6040: 91 F8                 STA  (DESTLO),Y ;ERASE A BYTE
6042: E6 FF                 INC  TEMP
6044: A4 FF                 LDY  TEMP    ;NEXT LINE
6046: C0 C0                 CPY  #$C0    ;CHECK FOR END OF SCREEN
6048: F0 03                 BEQ  DRAW
604A: CA                    DEX
604B: 10 E5                 BPL  ERASE1
                 *
604D: A2 07      DRAW       LDX  #$07
604F: A4 FB                 LDY  YLOC
6051: 84 FF                 STY  TEMP
6053: B9 C0 61   DRAW1      LDA  TABLO,Y
6056: 85 F8                 STA  DESTLO
6058: B9 00 61              LDA  TABHI,Y
605B: 85 F9                 STA  DESTHI
605D: BD E6 60              LDA  SHAPE,X ;GET A BYTE OF THE SHAPE
6060: A4 FA                 LDY  XLOC
6062: 91 F8                 STA  (DESTLO),Y ;PUT BYTE ON SCREEN
6064: E6 FF                 INC  TEMP
6066: A4 FF                 LDY  TEMP
```

```
6068: C0 C0             CPY  #$C0
606A: F0 0B             BEQ  READKEY
606C: CA                DEX
606D: 10 E4             BPL  DRAW1
606F: A5 FA             LDA  XLOC
6071: 85 FC             STA  OLDX
6073: A5 FB             LDA  YLOC
6075: 85 FD             STA  OLDY
               *
               * SHAPE HAS BEEN DRAWN.
               * TIME TO CHECK KEYBOARD AND
               * ADJUST LOCATION.
               *
6077: AD 00 C0 READKEY  LDA  $C000  ;CHECK KEYBOARD
607A: 30 02             BMI  FOUNDKEY ;IF MINUS, KEY HAS BEEN PRESSED
607C: A5 FE             LDA  OLDKEY ;USE LAST VALID VALUE
607E: C9 C1    FOUNDKEY CMP  #$C1   ;A
6080: F0 17             BEQ  UP
6082: C9 DA             CMP  #$DA   ;Z
6084: F0 23             BEQ  DOWN
6086: C9 88             CMP  #$88   ;LEFT ARROW
6088: F0 2F             BEQ  LEFT
608A: C9 95             CMP  #$95   ;RIGHT ARROW
608C: F0 37             BEQ  RIGHT
608E: C9 A0             CMP  #$A0   ;SPACE
6090: F0 4A             BEQ  PAUSE
6092: C9 9B             CMP  #$9B   ;ESCAPE
6094: F0 3F             BEQ  GETOUT
               *
               * NO VALID KEY HAS BEEN FOUND
               *
6096: 4C DE 60          JMP  KEYDONE
               *
               * ROUTINES TO HANDLE THE
               * VARIOUS KEYBOARD ENTRIES
               *
6099: 85 FE    UP       STA  OLDKEY
609B: C6 FB             DEC  YLOC   ;TOP IS 0 SO USE DEC TO MOVE UP
609D: A5 FB             LDA  YLOC
609F: C9 FF             CMP  #$FF   ;CHECK FOR WRAPAROUND
60A1: D0 3B             BNE  KEYDONE
60A3: A9 BF             LDA  #$BF
60A5: 85 FB             STA  YLOC
60A7: 30 35             BMI  KEYDONE ;ALWAYS TAKEN
60A9: 85 FE    DOWN     STA  OLDKEY
60AB: E6 FB             INC  YLOC
60AD: A5 FB             LDA  YLOC
60AF: C9 C0             CMP  #$C0
60B1: D0 2B             BNE  KEYDONE
60B3: A9 00             LDA  #$00
60B5: 85 FB             STA  YLOC
60B7: F0 25             BEQ  KEYDONE
60B9: 85 FE    LEFT     STA  OLDKEY
60BB: C6 FA             DEC  XLOC
60BD: 10 1F             BPL  KEYDONE
60BF: A9 27             LDA  #$27
60C1: 85 FA             STA  XLOC
60C3: D0 19             BNE  KEYDONE
60C5: 85 FE    RIGHT    STA  OLDKEY
60C7: E6 FA             INC  XLOC
60C9: A5 FA             LDA  XLOC
60CB: C9 28             CMP  #$28
60CD: D0 0F             BNE  KEYDONE
60CF: A9 00             LDA  #$00
60D1: 85 FA             STA  XLOC
60D3: F0 09             BEQ  KEYDONE
60D5: 2C 10 C0 GETOUT   BIT  $C010
60D8: 8D 51 C0          STA  $C051  ;RESTORE TEXT
60DB: 60                RTS
60DC: 85 FE    PAUSE    STA  OLDKEY
               * DELAY FOR A WHILE, THEN JUMP BACK
               *
60DE: A9 80    KEYDONE  LDA  #$80   ;TRY DIFFERENT VALUES HERE
60E0: 20 A8 FC          JSR  $FCA8  ;MONITOR DELAY ROUTINE
60E3: 4C 2C 60          JMP  ERASE
               *
               * SHAPE DEFINITION FOLLOWS.
               * IT IS STORED UPSIDE DOWN SINCE
               * IT IS INDEXED FROM BYTE 7 TO
               * BYTE 0.
               *
60E6: 00 41 49 SHAPE    HEX  0041495D7F5D4941

--- END ASSEMBLY ---

TOTAL ERRORS: 0

238 BYTES GENERATED THIS ASSEMBLY
```

desired shape. The best way to construct such a table, for now, is to use graph paper. See Figure 1 for an example.

For simple character graphics, the figure is one byte wide and eight bytes deep. This is by no means a requirement, but will help keep things simple for the moment. The bytes are placed sequentially in a table and looked up in order.

Character graphics can be used for doing simple animation and for placing text on the graphics screen. For an introduction, see Listing 7. This program moves a character on the screen under keyboard control. Use A and Z to move up and down, the arrow keys to move left and right. The space bar can be used to stop the motion and escape exits the program.

The program isn't actually a pure example of character graphics, since while the shape moves a byte at a time horizontally, it moves a single line at a time vertically.

Try playing with the delay value to produce the smoothest image. You will notice that the color problem created by odd and even positions is evident in this program. We'll look at that, go into further depth on character graphics, and look at other methods of screen manipulation next month.

Other Stuff

Again, I must thank those who wrote with questions or comments. Due to the nature of magazine schedules, this article is being written several months before it will be published. So, if you send a question this month, there's a chance the answer is covered in next month's article which, by the time you read this, will already have been written. (In other words, those of us involved with this sort of temporal madness have a hard time even telling what month it is.) But there are probably some things I have either missed or glossed over, so some answers will be appearing a bit out of order.

When necessary, I will devote some space to backtracking and answering questions that reached me after the topic was covered. A few readers have asked about the prize given each month, wondering exactly what *Shape Master* is. In answer, it is a program from Creative Computing for developing shape tables.

Several people have asked if I could review the various graphics packages that are on the market. While I appreciate such requests, my present position precludes such work. I'm sure such areas will be well covered by others.

Finally, you may have noticed that there has been no mention of Pascal or of graphics tablets in these articles. These are two areas with which I really don't have much experience, and will again have to leave to others.

That's all for this month. ☐

images...ibm images...ibm im

Will Fastie

Stay with me now — it's time for another time warp.

This is the Christmas issue of *Creative* which you have received in November, before Thanksgiving. I am writing this column in late August (my editor is holding her breath — I'm too close to the deadline, as usual). So for you, Christmas season is in progress (on TV, in toy stores, etc.) while for me, it is pretty far off. And it's not even Thanksgiving yet. Wait a minute, for *you* it's not Thanksgiving but for me . . . no, that's wrong, it's Christmas for me and . . . hold it, it's . . . oh forget it.

One thing is sure. It's Christmas for IBM and everyone else in the IBM game.

In a way, it *is* Christmas for me. This month's column is dedicated to my now-(in)famous mini-reviews of consumer software, so my table is heaped full of software of all descriptions, just waiting to be tried. I hope this brief tour of games and educational programs is of some value to you. I just want you to know that I have spent countless hours pouring over manuals, running the programs, and losing sleep so that you, my faithful readers, could have the best possible information. No sacrifice with these games, uh, er, that is, these consumer products, has been too great.

I have tried each of the software packages reviewed here. Many of the games have been reviewed in *Creative* and other publications before, so I didn't feel compelled to examine them in detail. I have pointed out special features, if any. Please take my comments as preliminary information, and look closely before you buy.

Reference Materials

Although the IBM documentation is very good, in many ways setting a new standard, there is always something to learn. I have encountered a number of books and other sources of information which I think might prove useful.

Books

First of all, there are the books which have been written specifically about the IBM Personal Computer. One of the first is *IBM's Personal Computer* (DeVoney and Summe, Que Corporation, 1982) which provides a general look at the IBM PC. I consider this book valuable if you are considering the PC, but less so if you already own one.

Another is *IBM Personal Computer: An Introduction to Programming and Applications* (Goldstein and Goldstein, Robert J. Brady, 1982) which is a reasonable introduction to programming in Basic on the PC.

The best Basic book for novices is *Elementary Basic* (Ledgard and Singer, Vintage Books, 1982). Although the book does not specifically relate to the IBM PC or the PC dialect of Basic, it is an excellent learning vehicle.

Ledgard and Singer also have *Elementary Pascal,* which is exactly the same book for Pascal. That too is excellent. Some might think the notion of "Learning to Program Your Computer In Pascal/Basic With Sherlock Holmes" is a little cute, but the books are entertaining, as well as effective. The programs that Holmes has you writing are quite sophisticated — more than you might think should be in an introductory text and more than you might think you could handle, but you will.

IBM/PC Survivor's Manual: A Primer for the IBM Personal Computer (Mayer, Mayer Associates, 1982) is a very light and easily read tutorial which was written by John Mayer when he became frustrated with the IBM documentation. When I first read this book I wasn't impressed, but later I went back and tried to read it as though I had never seen a computer before. In that context it is quite good, defining lingo and helping the reader find his way through the IBM books. It has only 35 pages, so the price of $11.95 is somewhat high.

Finally, *Practical Basic Programs: IBM Personal Computer Edition* (Poole (ed.), Osborne/McGraw-Hill, 1982) is a rewrite of a previous work. The rewriting was primarily in the programs, which were converted to the IBM Basic. No games here: the book will appeal to a business or scientific/technical audience. It is very well done. You can determine its value to you by reading the table of contents.

I have seen two VisiCalc reference books. The first is *An Introduction to VisiCalc Matrixing for Apple and IBM* (Anbarlian, McGraw-Hill, 1982). I found it difficult to work with and a little hard to read. It contains nine matrices each for the Apple and the

---

W. H. Fastie, 7110 Sheffield Road, Baltimore, MD 21212. Correspondence can only be acknowledged when a stamped, self-addressed envelope has been provided. Source Address: TCP394

IBM PC, a total of eighteen different models. If the models are of interest, the book might have some value.

A more carefully considered and constructed book is *The VisiCalc Book: Apple Edition* (Beil, Reston, 1982). Professor Beil writes that the IBM Edition is in the works and due out by now, as you read. I think the book is useful to any serious student of VisiCalc and is suitable as a self-teaching guide. This is a good one for business users, especially because of Chapter 11, "What Our Client, Secretary, or Supervisor Needs to Know: How Others Use Our Templates Successfully."

For the consumer, graphics is usually a passion. For those wishing to get all the technical details, *Fundamentals of Interactive Computer Graphics* (Foley and Van Dam, Addison-Wesley, 1982) is excellent. You can learn whatever you need to learn from this book, but be warned — it is serious stuff. A little computer science background, with above average math skills, is helpful.

A little less intimidating, but informative nonetheless, is *Microcomputer Graphics* (Myers, Addison-Wesley Microbooks, 1982). This book has a ton of programs, all for the Apple. Get it anyway: the programs can be translated to the IBM by having your buddy with the Apple tell you what the peculiar statements mean. Most are simple, like HPLOT, which can be replaced by PSET on the IBM.

Periodicals

I really do love *Creative Computing,* but it is certainly not the only place to learn about the PC. *PC: The Independent Guide to IBM Personal Computers* is devoted to the IBM system. The August issue was the best so far, helped considerably by Andrew Fluegelman. It is very slick and sexy, but in general the content could be better. But the *ads,* gad, the *ads* are great. It is like *Byte,* except that all the ads have something to do with the PC.

Then there is *Softalk for the IBM Personal Computer,* which is just getting started. I like *Softalk,* but the IBM version has a way to go before it matches the Apple version. Then there is *Personal Computer Age,* which tries hard but lacks editorial strength. Finally, *Dr. Dobb's Journal* seems to be carrying more content related to 16-bit microcomputers. For technically oriented people it is very good.

For timely information on new product releases and what is going on in general, the weekly newspaper *InfoWorld* is hard to beat. It also has regular reviews of software and hardware, which I have mostly come to respect.

And Now, The Reviews

Although it will probably mean that you will run right out to your LIBMPCD (local IBM Personal Computer Dealer) to buy some of these instead of finishing this column, I'll start the reviews with (dast I say it?) games.

First, some ground rules. Under the "system" entry in the profiles below, I have included only the most basic information, relying on your intuition to fill in the details. I have specified how much memory is required, how many disk drives are required, and which display type is needed.

The disk drive is always 160K unless otherwise specified. Display size is specified only when the width is meaningful; an entry which says either display (that is, either the IBM monochrome display, or the color/graphics adapter with a TV or other monitor) means either display at either width (80 or 40 columns). The operating system is either IBM DOS, or is not needed (for example, Microsoft *Decathalon* loads itself from disk and does not require DOS).

The "language" entry is purely informational. If Basic is required, I have only said Basic; the distinction between Advanced Basic and Disk Basic is unnecessary since owners of DOS have both anyway. Simply consult the instructions with each product. Mention of other languages, for example C, provides the more technical reader with some insights into performance. *Except for Basic, you do not need to own the language mentioned.*

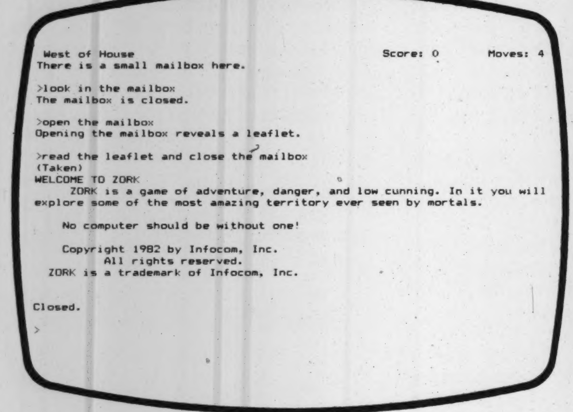
Games

Here we go. Be careful: buying too many of these games could be dangerous to your financial health.

creative computing
SOFTWARE PROFILE

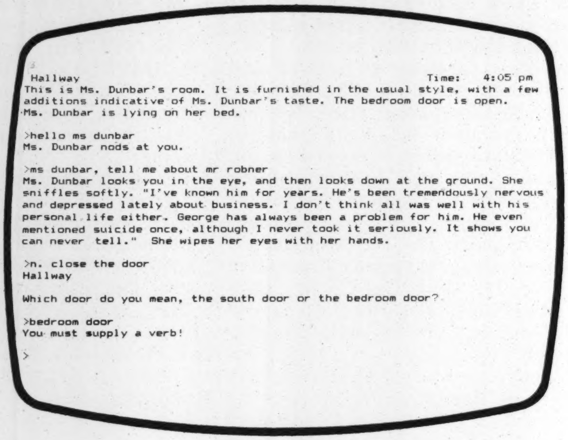
Name: Microsoft Decathalon
Type: Game
System: 64K IBM/PC, disk drive, color/graphics display
Format: Disk
Language: Basic
Summary: A classic
Price: $35
Manufacturer:
IBM Corporation
P.O. Box 1328
Boca Raton, FL 33432

Software City
THE PROGRAM DISCOUNT CENTERS
We know software for personal computers because software is our ONLY business.
Thousands of programs. In stock. At discounted prices.
MOUNT CISCO, NY, 187 Main St. (914) 666-6036
PINE BROOK, NJ, 101 Route 46 East (201) 575-4574
TEANECK, NJ, 161 Cedar La. (201) 692-8298
SUMMIT, NJ, 5 Beechwood Rd., (201) 273-7904
MONTVALE, NJ, 146 Kinderkamack Rd. (201) 391-0931
GREEN BROOK, NJ, 60 Route 22 West (201) 968-7224
FAIRVIEW, NJ, 251 Broad Avenue (201) 943-9444
Stores Opening Soon: Morristown, NJ Hartsdale, NY
ATTENTION EDUCATORS: Write for FREE Software Catalog
Specify: PET / Atari / Apple / TRS-80 (Please use school letterhead)
Academic Software Division, c/o Software City
22 East Quackenbush Avenue, Dumont, NJ 07628
Franchises Available/Box 313, Closter, NJ 07624
©1982 America's Number One Software Dealer Inc.
CIRCLE 320 ON READER SERVICE CARD



```
 West of House                                        Score: 0       Moves: 4
There is a small mailbox here.

>look in the mailbox
The mailbox is closed.

>open the mailbox
Opening the mailbox reveals a leaflet.

>read the leaflet and close the mailbox
(Taken)
WELCOME TO ZORK
     ZORK is a game of adventure, danger, and low cunning. In it you will
explore some of the most amazing territory ever seen by mortals.

    No computer should be without one!

    Copyright 1982 by Infocom, Inc.
          All rights reserved.
  ZORK is a trademark of Infocom, Inc.


Closed.

>
```

Zork.



```
 Hallway                                                  Time:   4:05 pm
This is Ms. Dunbar's room. It is furnished in the usual style, with a few
additions indicative of Ms. Dunbar's taste. The bedroom door is open.
Ms. Dunbar is lying on her bed.

>hello ms dunbar
Ms. Dunbar nods at you.

>ms dunbar, tell me about mr robner
Ms. Dunbar looks you in the eye, and then looks down at the ground. She
sniffles softly. "I've known him for years. He's been tremendously nervous
and depressed lately about business. I don't think all was well with his
personal life either. George has always been a problem for him. He even
mentioned suicide once, although I never took it seriously. It shows you
can never tell."  She wipes her eyes with her hands.

>n. close the door
Hallway

Which door do you mean, the south door or the bedroom door?

>bedroom door
You must supply a verb!

>
```

Deadline.

Microsoft's *Olympic Decathalon* on the Apple and TRS-80 computers is a great game, and the IBM version is every bit as good. One to six players compete in the Summer Olympics marathon of 10-events, you know, the one that got Bruce Jenner's picture on a million boxes of Wheaties.

Each event is shown with superb graphics, so good that the movement in some seems real. Of all the games reviewed here, *Decathalon* was most heavily played. My wife Sandy, who is not overly fond of computer games, is hooked. On two separate occasions, guests at our home ended up in front of the computer hurling shot, javelins, and "themselves" through the air. The game induced friendly competition, and enormous fun. We discovered that three couples could easily make an evening of just playing this single game.

If you buy no other game, buy *Decathalon.* It's money well-spent.

creative computing

SOFTWARE PROFILE

Name: Zork I, Zork II

Type: Adventure game

System: 48K IBM/PC, disk drive, either display

Format: Disk

Language: Interlogic machine language

Summary: Excellent adventures

Price: $39.95

Manufacturer:
Infocom, Inc.
55 Wheeler St.
Cambridge, MA 02138

I have mentioned these games in my column before. They are just as good now as they were then. These are text adventure games. The word "text" refers to the fact that graphics are not used, so the games can be played on either the monchrome display or a display attached to the color/graphics adapter. They are fun, well-written, and challenging. Commands to the programs are given in English sentences, with the program recognizing over 600 words.

Infocom should have released two new products by the time you read this. *Zork III* completes the trilogy (is this a trilogy of trilogies guys?). *Starcross* is a new game — a science fiction adventure.

For those who want to try an adventure but who would rather not invest the 40 (?) or so hours that it takes to solve all the problems, the Zork Users Group (P.O. Box 20923, Milwaukee, WI 53220) can help. The group has a complete line of products to complement the Infocom line. Maps are available and are a big help, and ZUG has just recently announced InvisiClues. These are books with commonly asked questions about, say, *Zork I,* but they also include the answers in invisible ink. A marking pen is included and is used to reveal the answers. ZUG also has supplies for *Deadline* (see below) and will have similar products for *Zork III* and *Starcross* by the time they are out.

creative computing

SOFTWARE PROFILE

Name: Deadline

Type: Mystery game

System: 48K IBM/PC, disk drive, either display

Format: Disk

Language: Interlogic machine language

Summary: A new genre, and excellent to boot

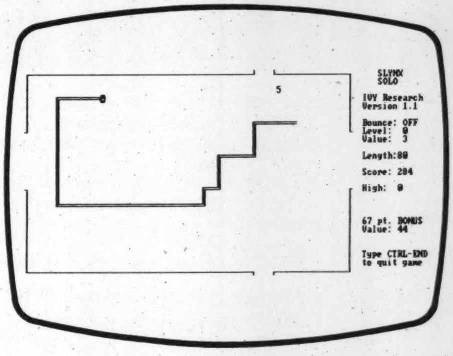
Price: $49.95

Manufacturer:
Infocom, Inc.
55 Wheeler St.
Cambridge, MA 02138

Marshall Robner is dead. The official report says it was suicide. But Mr. Robner's attorney writes you, the chief of detectives of Edindale, Connecticut, stating that he has no reason to doubt the police report except that Mr. Robner called him several days earlier to change his will. The plot thickens. Was Mr. Robner's death a suicide? Can you prove otherwise?

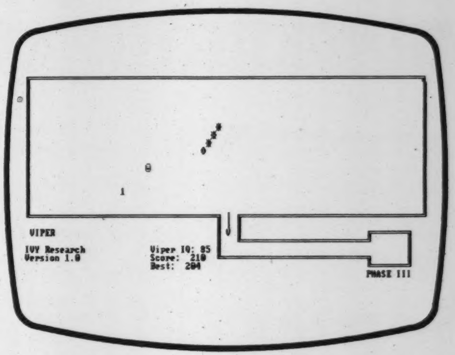
If you don't like the ordinary adventure game, you might like this one because it is a *real* situation, not a fantastic one. I particularly like the interaction with the characters encountered in the game during the course of play. I know of no other game that can boast such a level of realism.

The game is hard and offers challenge. As I have said before, your intuition will work, and you will not be surprised by unexpected monsters. The tradition of the *Zork* games is carried in *Deadline;* a big vocabulary, sentences (including compound ones), and interaction with people in the mystery are strong features.



```
SLYNX
SOLO

IVY Research
Version 1.1

Bounce: OFF
Level:  0
Value:  3

Length:80

Score: 204

High:  0

67 pt. BONUS
Value: 44

Type CTRL-END
to quit game
```

Slynx.



```
VIPER

IVY Research          Viper IQ: 85
Version 1.0           Score:  210
                      Best:  204
                                              PHASE III
```

Viper.

creative computing

SOFTWARE PROFILE

Name: Slynx and Viper

Type: Arcade-style games

System: 64K IBM/PC, disk drive, any 80-column display

Format: Disk

Language: C

Summary: Excellent

Price: $34.95 (Slynx),
$29.95 (Viper)

Manufacturer:
Ivy Research, Incorporated
88 Yale Station
New Haven, CT 06520

I was a little skeptical about these games at first, because I didn't think a good arcade-style game could be written using only the character graphics set. I was wrong. Both these games are challenging and fun. They are also very fast, and you'll have a lot of trouble getting proficient enough to play them at the fastest level.

In both games, the object is to collect points by "eating" them off the screen. In *Slynx*, you are the snake and you get longer as you eat the points. You lose at *Slynx* whenever your head hits the wall or your snake's body. In *Viper*, the snake is the enemy, prowling around and generally making a nuisance of itself. You lose at *Viper* if the snake touches you.

The sound can be suppressed in these games, making them suitable for office play. Joysticks are supported. Ivy is also working on *Dungeoneer*, an "interactive, full-screen sword and sorcery adventure"; *Medusa*, something like the arcade game Qix; and *Cashman*, a maze game.

creative computing

SOFTWARE PROFILE

Name: Temple of Apshai

Type: Adventure game

System: 64K IBM/PC, disk drive, color/graphics display

Format: Disk

Language: Basic

Summary: Well-implemented, but slow paced

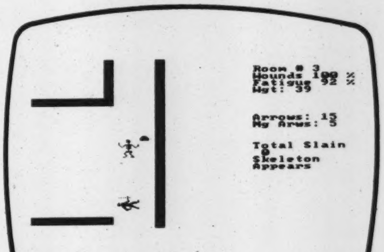
Price: $39.95

Manufacturer:
Automated Simulations
P.O. Box 4247
Mountain View, CA 94040

Temple of Apshai is quite well-known and apparently very popular. It is interesting because it is done with animated graphics and sound. You move a player through a maze of rooms, facing dangers at every turn. You are armed with a sword, with which you can thrust or parry, and a bow, with which you can shoot arrows. Swords swish and arrows fly as you fight spiders, skeletons, and other monsters. All this is very well done, and exciting, especially the first few times you play.

I have two negative feelings about the game. The first is that it does not keep me as interested as, for example, *Zork*. The *Apshai* graphical representation of the rooms is limited to a display of walls and hallways. Although *Zork* has no display, the descriptions evoke the sophisticated picture system called human imagination. I see more with *Zork* than with *Apshai*. The second is the pace of the game, which I found very slow. Especially frustrating was my player's fatigue level, which seemed to rise quite rapidly. Frequent rest stops were necessary to reduce fatigue, slowing the progress of the game even more.

Temple of Apshai.



```
Room # 3
Wounds 100 %
Fatigue 92 %
Wgt: 39

Arrows: 15
Mg Arws: 5

Total Slain
 0
Skeleton
Appears
```

One thing I did not like was the necessity to have the manual on hand at all times to provide me with additional information about the rooms and the treasures. I thought that information should have been available interactively from the program.

One thing I did like was the opening dialog between you, a traveler to the temple, and the Innkeeper, who provisions you for your journey. It is very well done, and extremely entertaining. I found the Innkeeper's negotiating skills very funny.

This game may be particularly appealing to younger players who will be attracted by the graphics. Adults should try it first, and buy only if the features prove interesting.

creative computing

SOFTWARE PROFILE

Name: Millionaire:
The Stock Market Game

Type: Game

System: 64K IBM/PC, disk drive, either display

Format: Disk

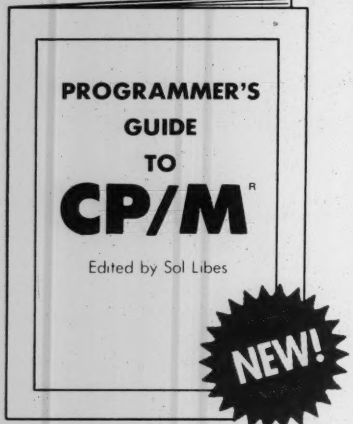
Language: Basic

Summary: Complex and realistic stock market simulation

Price: $49.95

Manufacturer:
Micro-Z Applications
22704 Ventura Blvd., Suite 141
Woodland Hills, CA 91364

Outstanding computer books for



Programmer's Guide to CP/M®
edited by Sol Libes

Here's an important collection of CP/M insights not available in any CP/M manual. CP/M is the most popular microcomputer DOS in use today, and this widespread use has spawned many enhancements of CP/M. **Programmer's Guide to CP/M** tells you what these enhancements are and how to put them to use, how to get around apparent limitations of a CP/M system and why CP/M is far more versatile than you might have thought. All articles originally appeared in *Microsystems* magazine. This guide gives you an in-depth look at CP/M from the viewpoint of the individual who creates the software that interfaces with CP/M, or who is installing CP/M on systems for which configurations do not already exist.
200 pages. $10.95 ($2 P&H) #**14C**

Computers for Kids
by Sally Greenwood Larsen

Computers for Kids is written for the elementary age child who is fascinated by computers, but put off by the reading level of most programming books. Published in four editions (Apple®, Atari®, TRS-80® or Sinclair ZX81), this delightful book features large, easy-to-read text, many illustrations and complete instructions. It tells how to write programs that print, do calculations and draw pictures. Also explains how to save and load programs, write flow charts and use BASIC language.
Softbound. $4.95. ($1 P&H) Specify: Apple, #**12G.** Atari, #**12J.** TRS-80, #**12H.** Sinclair ZX81, #**12S.**

Basic Computer Games
edited by David Ahl

A complete anthology of 101 favorite games and simulations, each complete with sample runs, program listings and description. All games run in standard Microsoft® BASIC and are easy to use with any computer. There are games just for fun, to develop logic strategies, to teach environmental solutions, to simulate athletic competition, to play alone or with a group.
200 pages, softbound. $7.95. ($1.50 P&H) #**6C**

More Basic Computer Games
edited by David Ahl and Steve North

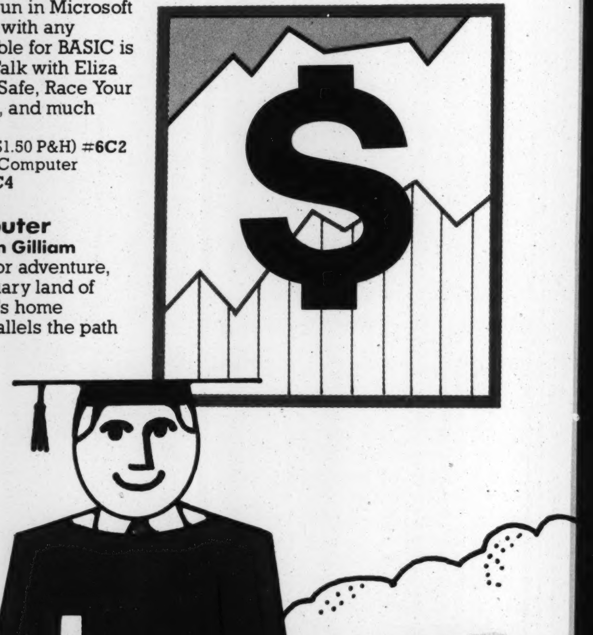
84 new games to challenge you. All are complete with program listings, sample runs and description. All run in Microsoft BASIC and are easy to use with any computer. A conversion table for BASIC is included. Games include Talk with Eliza the Psychologist, Crack a Safe, Race Your Ferrari, Joust with a Knight, and much more!
200 pages, softbound. $7.95 ($1.50 P&H) #**6C2**
TRS-80 Edition of More Basic Computer Games $7.95. ($1.50 P&H) #**6C4**

Katie and the Computer
by Fred D'Ignazio and Stan Gilliam

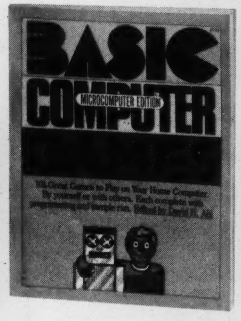
In this delightful full-color adventure, Katie "falls" into the imaginary land of Cybernia inside her daddy's home computer. Her journey parallels the path of a programming command through a computer. While the book is aimed at children 4 to 10, parents can use the supplemental information to relate the story to actual computer operation. *Infosystems* calls this book "entertaining and educational."
36 pages, hardbound. $8.95. ($2.00 P&H) #**12A**

Getting Acquainted with Your VIC®20 (Revised Edition)
by Tim Hartnell

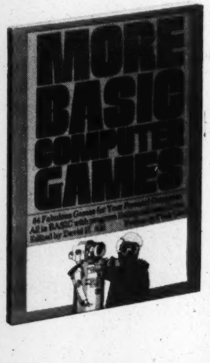
This book leads the reader from the absolute basics of programming the VIC to writing complex, sophisticated programs. It thoroughly describes the use of the sound, music and color graphics capabilities, and illustrates the use of these functions in over 60 programs and games. By following the comprehensive explanation given for



COMPUTERS FOR KIDS



Katie AND THE COMPUTER



home, school or business uses!

each program and computer function, the reader will learn a great deal about the VIC, the BASIC language and microcomputers in general.
132 pages, softbound. $8.95. ($2.00 P&H) #**15R**

Computers in Mathematics: A Sourcebook of Ideas

edited by David Ahl

This best-selling book contains scores of pragmatic, easy-to-use, classroom-tested ideas in dozens of different areas. Covers probability, problem solving, approximations, binary counting, regression analysis, proof of geometric theorems, drill and practice programs, art and graphing programs. Complete program listings and sample runs are included, plus a section of over 250 problems, puzzles and programming ideas.
224 pages, softbound. $15.95. ($2 P&H) #**12D**

Best of Creative Computing, Volume I

edited by David Ahl

All the articles, stories, learning activities, games and puzzles that appeared in Volume I of *Creative Computing.* Covers computer applications in education and recreation. Over 200 contributors, from college professor to U.S. Senator to science fiction author. A must for anyone concerned with the growth of computers and their increasing role in American society.
328 pages, softbound. $8.95. ($2 P&H) #**6A**

Best of Creative Computing, Volume II

edited by David Ahl

The best features from *Creative Computing's* Volume II. A potpourri of information on languages, programming theory, artificial intelligence, computers in education and computers and the arts. Many puzzles and games.
336 pages, softbound. $8.95. ($2 P&H) #**6B**

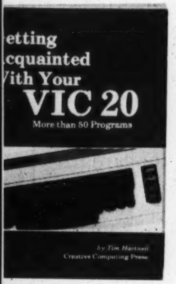
Best of Creative Computing, Volume III

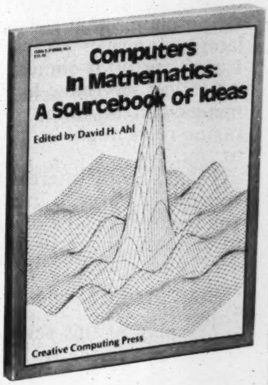
edited by David Ahl & Burchenal Green

Articles, fiction, games, programs and more from Volume III of *Creative Computing.* Features on technology, public access, educational use of computers, medical applications and computer music. Reviews of calculators, games, equipment, software and books. Many puzzles, programs and games.
336 pages, softbound. $8.95 ($2 P&H) #**12C**

CALL TOLL FREE 800-631-8112
(IN NJ) 201-540-0445
CHARGE AND PHONE ORDERS $10 MINIMUM
PLEASE HAVE AD AT HAND WHEN ORDERING

The Best of
creative computing
Edited by David H. Ahl
Volume 1
THE BEST OF
creative computing
VOL. 2 EDITED BY DAVID AHL
The Best of
creative computing
Volume 3
Edited by
David H. Ahl
and
Burchenal Green


Getting
Acquainted
With Your
VIC 20
More than 50 Programs
by Tim Hartnell
Creative Computing Press


Computers
In Mathematics:
A Sourcebook of Ideas
Edited by David H. Ahl
Creative Computing Press

creative computing Dept. CD24 • 39 East Hanover Avenue • Morris Plains, NJ 07950

Please send books listed below:

Item No.	Qty.	Price Each	P&H*	Total Price

*P&H charge indicated in parentheses ( ). Foreign orders (excluding Canada and Mexico) add an additional $3 per order; shipped airmail only.

☐ Send FREE Catalog.

☐ **PAYMENT ENCLOSED** $________. NJ residents add 5% sales tax.

☐ **CHARGE MY:** ☐ American Express ☐ MasterCard ☐ Visa

Card No.________________ Exp. Date________

Signature________________

Print Name________________

Address________________

City/State/Zip________________

For faster service, **PHONE TOLL FREE:** 800-631-8112. Please have ad at hand when ordering.
(In NJ only: 201-540-0445)
Institutions only—purchase orders under $50 not accepted. Dept. CD24

REGISTERED TRADEMARKS:
Apple: *Apple Computer, Inc.* Atari: *Atari, Inc.*
CP/M: *Digital Research, Inc.* Microsoft: *Microsoft Consumer Products, Inc.* TRS-80: *Radio Shack Division of Tandy Corp.*
VIC: *Commodore Business Machines.*

creative computing

SOFTWARE PROFILE

Name: Stocks & Bonds

Type: Game

System: 64K IBM/PC, disk drive, either display

Format: Disk

Language: Basic

Summary: Simplistic stock market simulation, but entertaining.

Price: $25

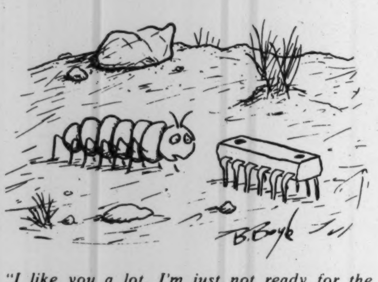
Manufacturer:
MicroComputer Games/
Avalon Hill
4517 Harford Rd.
Baltimore, MD 21214

Both of these games are simulations of investment trading in the stock market. The similarity between them ends here.

Millionaire is a very complex game and has obviously been put together with much care. The simulation is detailed, and the player can invest by buying and selling stocks, calling and putting options, and by borrowing against his net worth. However, these investment opportunities must be earned. You begin the game as a "novice," and by improving your net worth advance to "speculator," "professional," "broker," and ultimately "millionaire" (the object of the game). As you attain each new level you gain new abilities.

The game is played by one player at a time. However, the system can save the game status for up to 14 players. The saved games are stored by player initials and are easily retrieved. As you might expect, the games can be quite long. A side-effect of the complexity is that it takes about five minutes to set up a new game.

Stocks & Bonds is a much simpler game. Up to six may play at one time, and the game moves rapidly. The simulation is not complicated at all, but the number of possible combinations of events makes detecting the playing patterns difficult.



"I like you a lot. I'm just not ready for the sedentary life."

I recommend *Stocks & Bonds* for someone looking for entertainment and *Millionaire* for someone who is serious about playing and willing to invest the necessary time.

creative computing

SOFTWARE PROFILE

Name: Lost Colony

Type: Simulation game

System: 48K IBM/PC, disk drive, either display, 80-columns

Format: Disk

Language: Basic

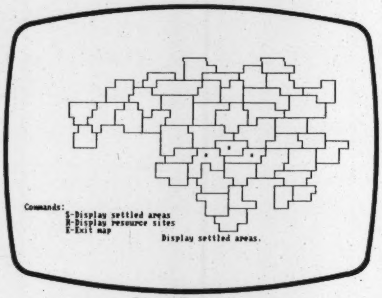
Summary: Complex but interesting simulation

Price: $29.95

Manufacturer:
Acorn Software Products, Inc.
634 North Carolina Ave., S.E.
Washington, D.C. 20003

Lost Colony is a simulation of a population of humans stranded on a planet far from Earth. You have been elected the "economic manager" and given the primary responsibility for the development of the planet. It is up to you to juggle all the resources and try to keep the standard of living, and the population's morale, up.

It is a tough job, though, and a careful balance and even hand are required. And you must balance your time too, because the game can be very long. Games can be saved; the saved game always has the same name so different saved games require different disks.



```
Commands:
         S-Display settled areas
         R-Display resource sites
         E-Exit map
                              Display settled areas.
```

Lost Colony.

The game is primarily a text game, but a map of the colony can be displayed on either a graphics display or on the standard IBM monochrome display. The screen image shown here was derived from the monochrome.

All in all, the *Lost Colony* is a good simulation that will require thoughtful play to master.

creative computing

SOFTWARE PROFILE

Name: Casino Blackjack

Type: Game

System: 64K IBM/PC, disk drive, color/graphics display

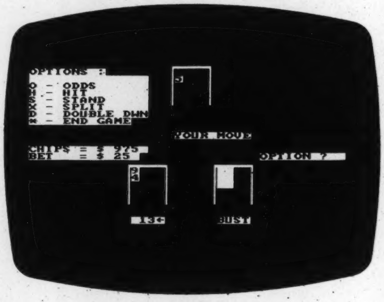
Format: Disk

Language: Basic

Summary: Very good, with minor deficiencies

Price: $24.95

Manufacturer:
Survey Systems, Inc.
7507 Princeton Ave.
College Park, MD 20740



```
OPTIONS :
O - ODDS
H - HIT
S - STAND
X - SPLIT
D - DOUBLE DWN
* - END GAME

                     YOUR MOVE
CHIPS = $ 975
BET   = $ 25                         OPTION ?

                 13+         BUST
```

Casino Blackjack.

There are quite a few Blackjack games on the IBM PC market already. I don't understand this, but maybe that's because I'm not a high roller. Both of the game collections reviewed here (see following profiles) include Blackjack, and there are at least four other versions which I have seen advertised but have not tried. My friend Rich even wrote himself a version as one of the very first programs written on his PC.

Casino Blackjack is a pretty good version, and may be the package to buy for someone who wants to learn all the details of the game. The documentation claims that the program simulates casino rules "exactly," something I can't verify. It comes set to play by Atlantic City rules, but all the parameters can be adjusted to whatever casino rules might be more interesting to you.

What's really interesting about this version, however, is its ability to show you the odds of a hit or stand decision, to show you the cards remaining in the deck, and to keep count of the cards to assist you in learning how to become a "counter."

My play of this version was pretty simple, and since I am not interested in learning a technique which will get me thrown out of any casino in the world, I didn't examine the advanced features at any great length. My only criticism

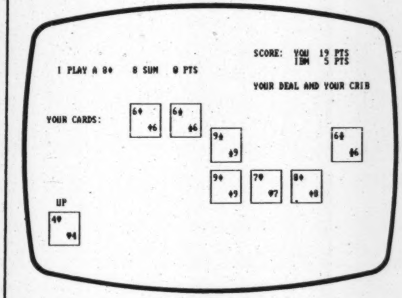
IBM, continued...

of the game is its requirement for a graphics display, since the versions from the packages below did very nicely on the monochrome display. I found Survey's graphics a little hard to read, especially in black and white.

creative computing
SOFTWARE PROFILE

Name: Games Package I
Type: Game set
System: 48K IBM/PC, disk drive, either display
Format: Disk
Language: Basic
Summary: Good games; extraordinary value
Price: $29.95
Manufacturer:
Ensign Software
2312 N. Cole Rd., Suite E
Boise, ID 83704

This package is a great buy. The games included are Qubic (three-dimensional Tic-Tac-Toe), Othello, Kingdom, Cribbage (!), Black Box, Space Trek, Blackjack, Mastermind, and two facts quizzes, Americans and Presidents.



```
I PLAY A 8♦    8 SUM    0 PTS          SCORE:  YOU  19 PTS
                                               IBM   5 PTS

                                       YOUR DEAL AND YOUR CRIB

YOUR CARDS:

UP
```

Cribbage.

I love Cribbage, which is a card game, and I played quite a few of the games. The program plays quite well, as it won a majority of games against a very good player (me!). I found it to be a little slow, but not intolerable. The representation of the play is very well done.

Space Trek is a pretty good version of the Star Trek game. The display is clean and the game is smooth. Blackjack play is represented very nicely, perhaps better than the others I have seen. I didn't like the display of Qubic, since it is hard to see diagonals. Black Box, a game in which you must locate invisible objects in a box by shooting rays in and seeing where they come out, was very nicely done. Othello was a little slow, and since I won with my limited experience, I assume the game could be better. Other players (I *do* try to get other opinions) say they liked it.

These games share one thing in common: they are very well engineered and are mostly idiot proof. A menu is included from which each game can be invoked, and the menu returns at the end of each game. The instructions are clear and the human factors are above average.

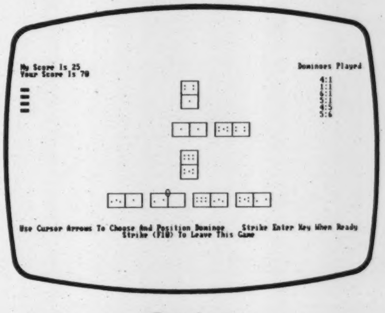
creative computing
SOFTWARE PROFILE

Name: FriendlyWare: P.C. Introductory Set
Type: Game Set (and more)
System: 64K IBM/PC, disk drive, either display, 80-columns
Format: Disk
Language: Basic
Summary: A lot of programs, medium quality
Price: $49.95
Manufacturer:
FriendlySoft, Inc.
213 Pebblebrook
Arlington, TX 76014

My reaction to this package is mixed. Of all the games, my favorite was Dominoes, which was surprisingly good with a very satisfactory screen display. The FriendlySoft versions of games which I have tried in other packages, such as Othello or Blackjack, were not as good as their competitors. None of the included games were action games, although there was some limited animation in Sea Battle.

The only other game in the package that I had real fun with was Match, a version of the Concentration television game show. The game was a very faithful recreation of the TV version, and summoned up visions of Hugh Downs and the famous clacking gameboard. In fact, the computer display looks just like the TV board.

The strength of the product lies elsewhere, it turns out, in the program called "Introduction to Computers." This is an on-line tutorial, paralleled by the manual, that describes how the PC works and provides some history of computing. The best part is "Anatomy of a Program" in which FriendlyWare's version of Mastermind is dissected and explained.



```
My Score Is 25                                      Dominoes Played
Your Score Is 70
                                                         4:1
                                                         1:1
                                                         6:1
                                                         5:1
                                                         4:5
                                                         5:6

Use Cursor Arrows To Choose And Position Dominoe    Strike Enter Key When Ready
                       Strike (F10) To Leave This Game
```

Dominoes.

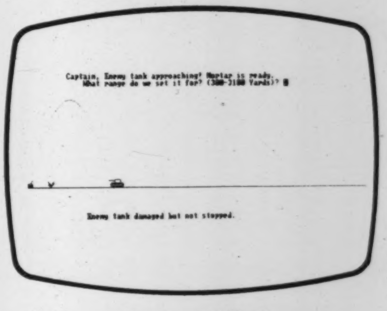
I would have rather settled for fewer programs (there are 25 on three disks) but better versions of those included.

creative computing
SOFTWARE PROFILE

Name: Programs #1: Nine Programs for the IBM Personal Computer
Type: Programs for personal use
System: 48K IBM/PC, disk drive, either display (some games require graphics)
Format: Disk
Language: Basic
Summary: You can probably write them yourself.
Price: $19.95 ($2 shipping)
Manufacturer:
Pittsburg Computer Exchange
112 Marble Dr.
Bridgeville, PA 15017

This package of games loses out by comparison with Ensign's *Games Package I*. The nine programs (IRA calculator, Math Practice, Guess the Number, Target Practice, Sketch Pad, Mortar and Tank, Box Game, Gas MPG Comparison, and Race Cars) are not of professional quality. Only one game, Mortar and Tank, held my interest for any length of time, and I was still frustrated by the way in which the game worked. I suppose my biggest objection to the set is the fact that all the programs could be written in short order by a relatively inexperienced programmer, and I don't like to spend money when that's the case.

The package was out early in the life of the PC, and perhaps it was hasty. I have not seen any other products from the same manufacturer.



```
Captain, Enemy tank approaching! Mortar is ready.
    What range do we set it for? (300-3100 Yards)? ■

Enemy tank damaged but not stopped.
```

Mortar and Tank.

IBM, continued...

creative computing
SOFTWARE PROFILE

Name: Andromeda Conquest

Type: Game

System: 48K IBM/PC, disk drive, either display

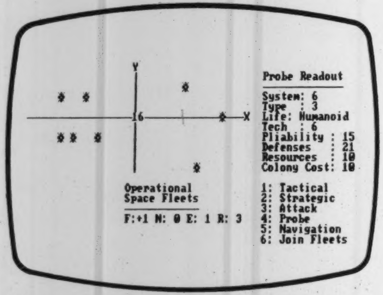
Format: Disk

Language: Basic

Summary: Interesting, but difficult to understand and play

Price: $25

Manufacturer:
Microcomputer Games/
Avalon Hill
4517 Harford Rd.
Baltimore, MD 21214



```
Probe Readout
System: 6
Type   : 3
Life: Humanoid
Tech   : 6
Pliability : 15
Defenses   : 21
Resources  : 10
Colony Cost: 10

Operational
Space Fleets
F:+1 N: 0 E: 1 R: 3

1: Tactical
2: Strategic
3: Attack
4: Probe
5: Navigation
6: Join Fleets
```

Andromeda Conquest.

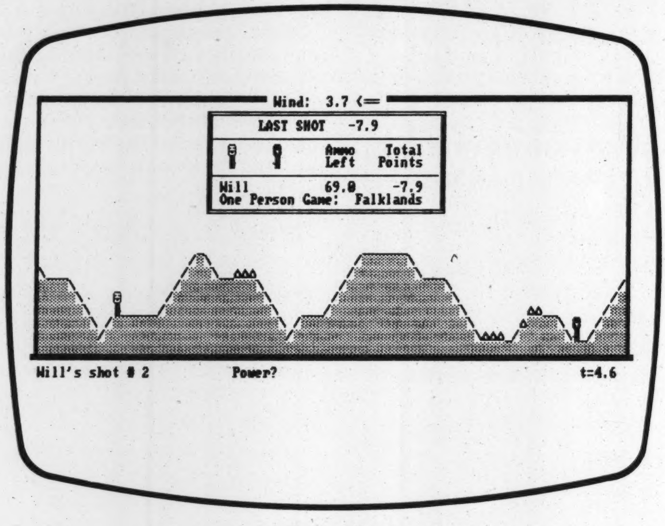
You must take these comments with a grain of salt. I can't believe the game is as difficult to play as I found it, and I think maybe I have a blind spot. I just couldn't get going, couldn't understand the instructions, and couldn't see the point. However, Avalon Hill has built the game for TRS-80, Atari, Apple, and Pet, and I can't believe they would have bothered with the PC version if the game hadn't been popular.

My main problem was figuring out how the game worked. I really got twisted up, and since I couldn't immediately see the effect my moves were having, I wasn't getting the feedback needed to learn the game. I also thought that there was not enough information on the screen, or at least available on-line.

You might want to check with someone you know who has the game and is familiar with it. They can help you decide if the game is worth the investment. The fact that I couldn't get the hang of it is no indictment.

I love *Projectile*. I played against Rich and he likes it too.

The game is simple. A very pretty display, considering it uses only the character graphics set, is drawn showing terrain (which varies from game to game), cities, and combatants. You must specify the power of your shot, and the angle of your cannon. You must consider the wind, which varies in intensity and direction; the terrain, which may include a mountain or valley or two; and the location of cities, which result in penalties if hit. The object is to obliterate your opponent (the game is considerably less violent than these words make it seem).



```
Wind:  3.7 <==
LAST SHOT   -7.9
                  Ammo    Total
                  Left   Points
Will              69.0     -7.9
One Person Game:  Falklands

Will's shot # 2          Power?                              t=4.6
```

Projectile.

creative computing
SOFTWARE PROFILE

Name: Projectile

Type: Game

System: 64K IBM/PC, disk drive, either display, 80-columns

Format: Disk

Language: Basic

Summary: Excellent game; very entertaining

Price: $20

Manufacturer:
KK Games
251-D Quinby Rd.
Rochester, NY 14623

The program loading instructions are on the disk label, and the operating instructions are provided by the program. It is very easy to use and very smooth in operation. You can play against an opponent or by yourself.

Although simple, the game is very entertaining. There are many little features that are very well done. The only improvement I could think of was a better way to select the force and angle of shot so that a non-reading child could play. My son likes the looks of the game, but can't play it yet. This is a difficult problem to solve for a game which uses only the character graphics.

I found *Podlaserium* to be addictive in the extreme. I think the concept is good, although once you understand a few principles of the game, you can develop a strategy that will maximize points *provided luck is with you.* That is the essence of the problem, in that the winning strategy doesn't always win.

"...so it only stands to reason that if the same thousand chickens pecked on keypunches for a thousand years that one of them would end up working for IBM."

creative computing

SOFTWARE PROFILE

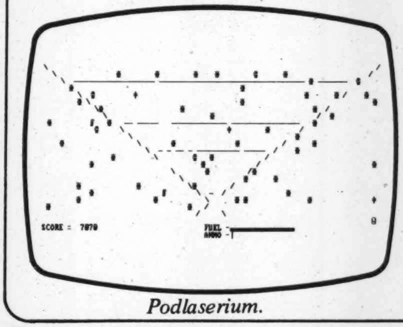
Name: Podlaserium
Type: Game
System: 64K IBM/PC, disk drive, either display, 80-columns
Format: Disk
Language: Basic
Summary: Addictive
Price: $34.95
Manufacturer:
DP Computer Services Co.
5019 North Washington Blvd.
Arlington, VA 22205

"Pods" appear at random in the sky above you. You have one laser cannon at the bottom of the screen, a supply of shots, and fuel to move the cannon from side to side. The cannon will also wrap from right to left and vice versa, a fact not mentioned in the instructions. As the pods appear, you shoot them. Each 1000 points earns you additional fuel and each 2000 points earns you more shots. The game is over when either fuel or ammunition is exhausted.

The pods have different values: 10, 50, 100, or 300 points. Since you have about 40 shots initially, it is obvious that shooting at 10-point targets won't ever earn you an ammunition bonus. So the trick is to get the high scoring targets at all times, leaving the other pods in place. If the game does not offer sufficient high-value targets, you are stuck. In addition, it is critically important to make every shot count. A missed shot reduces significantly your chance of attaining a high score.

Of all the games I tested, I had the most objections to this one even though I played it a lot. I found it slow, and somewhat tedious. There were too many questions to answer between games, making getting to the next game an annoying experience. Upper case input is required. The use of the F7, F9, and F10 keys is preposterous, although left-handed players might like it. The end game processing, in which the game subtracts remaining pods from your score, takes 90 seconds — far too long (I used the BREAK key and restarted the program to avoid this phase, even though it meant losing the ability to store high scores).

The game requires a password to operate. The purchaser must call the company to obtain the password for his version. I understand the motive, but consumer products can't really work that way.



Podlaserium.

creative computing

SOFTWARE PROFILE

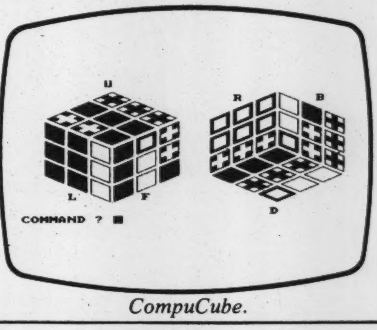
Name: CompuCube
Type: Game
System: 48K IBM/PC, disk drive, color/graphics display
Format: Disk
Language: Basic
Summary: Very good Rubik's Cube program that can solve a scrambled cube
Price: $29.95
Manufacturer:
Stoneware, Incorporated
50 Belvedere St.
San Rafael, CA 94901

creative computing

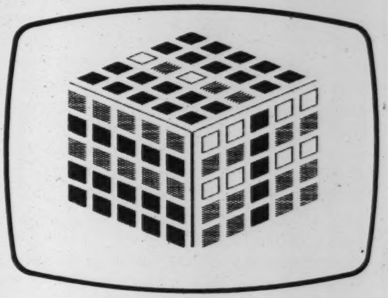
SOFTWARE PROFILE

Name: Polycube
Type: Game
System: 48K IBM/PC, disk drive, color/graphics display
Format: Disk
Language: Basic
Summary: Fast cube program with seven cube sizes
Price: $26.95
Manufacturer:
Linear Aesthetic Systems
P.O. Box 23
West Cornwall, CT 06796

These two programs enable you to manipulate Rubik's Cube. *CompuCube* is the more sophisticated of the two because it also will solve a scrambled cube that you set up. It cannot be fooled — an impossible cube configuration will be identified as such. The program allows either 2x2 or 3x3 cubes to be manipulated.



CompuCube.



Polycube.

The biggest problem with the program is that each move is displayed rather slowly. The entire screen is cleared and the cube is redrawn. *CompuCube* also displays the backside of the cube, a nice feature that sometimes can also induce some confusion.

Polycube allows cubes from 1x1 to 7x7. The display is very fast as only the faces that change after a move are redisplayed. The back of the cube is not visible.

Polycube is for those wishing to have a computerized version of the cube, and more sizes than the physical game device allows. *CompuCube* is for those wishing to have the computer solve the puzzle from any starting point. This is the strongest feature of *CompuCube:* it can show you, step by step, how to solve a cube you set up.

creative computing

SOFTWARE PROFILE

Name: Galaxy Master
Type: Arcade game
System: 64K IBM/PC, disk drive, either display, 80-columns
Format: Disk
Language: Basic
Summary: Reasonable concept, but too slow
Price: $29.95
Manufacturer:
Info-Pros, Inc.
2102 Business Center Dr.
Suite 132
Irvine, CA 92715

In *Galaxy Master* you control a ship which can move anywhere on the screen with its laser pointing toward the top at all times. Enemy ships move across the screen from right to left and will file on you if they get too close. The object is to score as many points as possible without getting destroyed.

I would have enjoyed the game more if it ran faster. I think this is one game that could benefit from the Basic Compiler. The main problem is that keystrokes don't necessarily take effect the instant you make them. They are stored by the PC keyboard buffer, and Basic sees them when it gets around to it. This creates the situation in which you are directly under the enemy ship and you hit the fire key, only to discover that the program is not listening to you. Result: you are zapped, but left wondering how it could have been avoided. The answer is to fire *before* the target is actually in front of you. Torpedoes also suffer from the slowness of the game — it is tough to learn when they should be fired.

Unless the game becomes more responsive in a future version, it is hard to recommend.

creative computing

SOFTWARE PROFILE

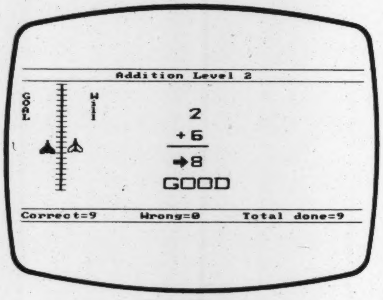
Name: Football Predictor
Type: Serious game
System: 64K IBM/PC, disk drive, either display
Format: Disk
Language: Basic
Summary: For those interested in predicting game outcomes
Price: $39.95
Manufacturer:
C&C Software
316 Nancy Lynn Cr., Suite 26-B
Knoxville, TN 37919

I haven't had time to really try this program, and I list it here only because by the time you read this it will be well into the football season. The program runs smoothly, asking clear questions about the information it wants. It provides a simple answer: which of two teams will win, and by what score.

The only problem I have with this game is that it cannot save data, so you must manually record all the data and re-enter it each time. The program admits to real value only after four or so weeks worth of information has been collected. Once the data is entered, the program compiles the statistical result.

Educational Products

IBM has been the most aggressive so far in the announcement of products for the education market. Of the six packages I have, four came from IBM and a fifth from IBM subsidiary, SRA (Science Research Associates). Actually, three of the four IBM offerings were also written by SRA. Here they are.



```
                Addition Level 2

                        2
                       +6
                      ---
                       →8
                      GOOD

Correct=9        Wrong=0        Total done=9
```

Fact Track.

HI..
ENTER
PASSWORD..
HAVE A CANAPE..
ENTER DATA..
HAVE A DRINK..
VALIDATE
DATA..

"Now that's my idea of a 'user-friendly' system!"

I can say with some authority that this is an excellent product. I tried it myself for a while, but the acid test came when I took my computer to my son's school for a demonstration. The class was pre-first, in between kindergarten and first grade. The children have some reading skills, and all know their numbers. They have some ability to add and subtract small numbers, so *Fact Track* was not beyond their abilities.

creative computing

SOFTWARE PROFILE

Name: Fact Track
Type: Educational game
System: 64K IBM/PC, disk drive, color/graphics display
Format: Disk
Language: Basic
Summary: Excellent arithmetic facts teaching game
Price: $90
Manufacturer:
IBM/SRA
P.O. Box 1328
Boca Raton, FL 33432

What amazed me was the readiness with which the kids played at the drill. They really liked it, and those who played again improved. The program is very well-written and extraordinarily well-engineered. I think the part that shows each kid the score for the round by running a flag proportionally up the flagpole both amused them and gave them a competitive objective.

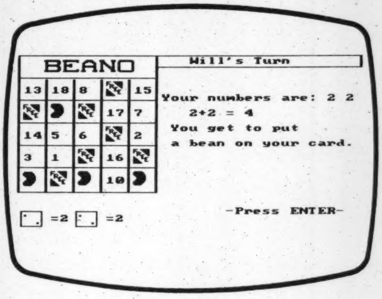
I did not have the time to try all the game options on that class, but my son has tried several of them, and he is willing to play for quite reasonable amounts of time, considering that there are no space ships or monsters.

Both of these game sets include two

creative computing

SOFTWARE PROFILE

Name: Arithmetic Games (Set 1 and Set 2)
Type: Educational game
System: 64K IBM/PC, disk drive, color/graphics display
Format: Disk
Language: Basic
Summary: Excellent arithmetic facts teaching game
Price: $60 each
Manufacturer:
IBM/SRA
P.O. Box 1328
Boca Raton, FL 33432



13	18	8	FREE	15
FREE	●	FREE	17	7
14	5	6	FREE	2
3	1	FREE	16	FREE
●	FREE	●	10	●

```
BEANO          Will's Turn

Your numbers are: 2 2
   2+2 = 4
 You get to put
 a bean on your card.

=2    =2          -Press ENTER-
```

Arithmetic Games.

games. I liked Set 1, with Beano and Rockets, best.

Both sets have the same objective. They try to teach arithmetic relationships in an entertaining fashion. I'll use Beano as an example.

Beano is a Bingo-like game. The computer issues you a card with a 5x5 grid and numbers in each square of the grid. Some of the squares are marked FREE and have no number; the level of the game being played determines how many free spaces are given. The computer then rolls the dice for the player. The numbers from the dice must be used to write a formula that will yield one of the numbers showing on the card. If such a formula can be built, a "bean" is placed on that square. The object is to get a row of beans in any direction.

The formulas can include addition, subtraction, multiplication, and division, and parentheses can be used to force a desired order of evaluation. Simply stated, these games teach "How can I put these numbers together to get a result that will help me win?"

A single player can play against the computer or two players can compete. There are different levels of play; I found that the hardest level for me against the easiest level for Josh (age 6) was fair — he won.

As with *Fact Track* these games are well-written and well-engineered.

creative computing

SOFTWARE PROFILE

Name: Cross Clues (Set 1)

Type: Word game

System: 64K IBM/PC, disk drive, either display

Format: Disk

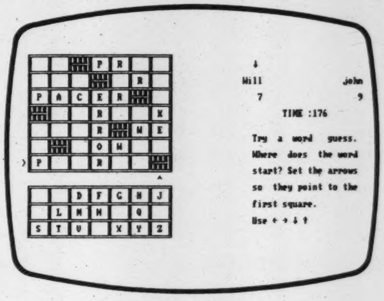
Language: Basic

Summary: Original word game requiring fast thinking

Price: $29.95

Manufacturer:

Science Research Assoc., Inc.
155 North Wacker Dr.
Chicago, IL 60606



		■	P	R		
			■		R	
P	A	C	E	R	■	
■			R			K
			R	■	W	E
	■		O	W		
P			R			■

		D	F	G	H	J
	L	M	N		Q	
S	T	U		X	Y	Z

```
↓
Will                    john
  7                        9
        TIME :176

Try a word guess.
Where does the word
start? Set the arrows
so they point to the
first square.
Use ← → ↓ ↑
```

Cross Clues.

SRA is marketing this one on their own, unlike the products they did for their parent which then carried the IBM logo. *Cross Clues* is also available for the Apple, which may account for the difference in marketing strategy.

I think the game is interesting, but it received mixed reactions from my wife and our guests one evening. The game can be very tough, and you play against the clock (as well as an opponent). The object is to find as many of the words as possible and achieve the highest possible score while doing so.

The game displays a grid much like a crossword puzzle. You must randomly guess letters to get started, as there are no crossword puzzle clues. As you get letters, and then words, those letters showing on the board begin to provide clues about subsequent words. As you succeed or fail, you also provide information to your opponent, so some strategizing is necessary.

Fifty different sets of words are provided, and any game can be called up randomly. A chart is provided in the instructions so you can keep track of which sets you have played.

creative computing

SOFTWARE PROFILE

Name: Typing Tutor

Type: Educational product

System: 48K IBM/PC, disk drive, either display

Format: Disk

Language: Basic

Summary: Microsoft's famous program for the IBM

Price: $25

Manufacturer:

IBM/Microsoft
P.O. Box 1328
Boca Raton, FL 33432

I can keep this one short. *Typing Tutor* has been reviewed many times, and always favorably. All I'll say about the IBM version and my use of it is that I am very impressed.

creative computing

SOFTWARE PROFILE

Name: The Speed Reader

Type: Educational product

System: 64K IBM/PC, disk drive, either display

Format: Disk

Language: Basic

Summary: Learn to speed read by computer

Price: $74.95

Manufacturer:

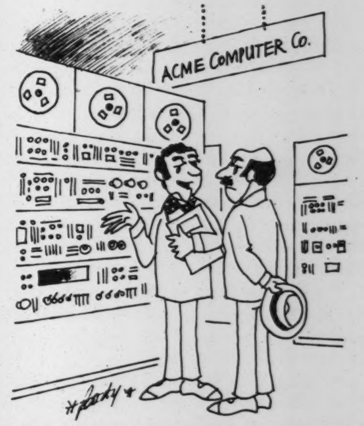
Davidson and Associates
6069 Goveoak Pl., #14
Rancho Palos Verdes, CA 90274

The Speed Reader is a product that allows you to learn to speed read with your IBM PC. It includes all the features I remember from my speed reading course, and provides excellent eye movement exercises (eye movement is critical for speed reading). The product is a combination of the software programs on the disk and the program of study in the manual. Following the program carefully, in the order prescribed by the manual, should result in the improvement of your reading speed with no loss of comprehension.

I think the program is well-engineered and will be a very satisfactory investment for someone wanting to improve his reading skills. It is less expensive than a course and has the advantage of allowing you to work at your pace with an instructor who will not tire.

The program is also available for Apple Computers.

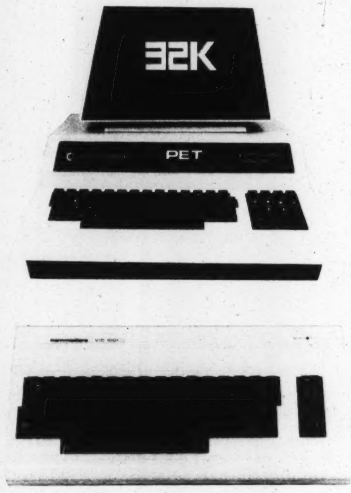
That's it. Next month, more games, home financial programs, and more. 'Til then, Merry Christmas (or is it Happy Thanksgiving?). ☐


ACME COMPUTER Co.

"This machine is guaranteed for ten thousand operations or until it malfunctions, whichever comes first."

Greg Yob

Personal Electronic Transactions



I am happy to hear from you, and encourage your correspondence. I will try to acknowledge all correspondence, and a SASE makes things easier for both of us. Please send your letters to "Personal Electronic Transactions" c/o PO Box 354, Palo Alto, CA 94301.

Well, this is the Christmas issue of our favorite magazine, so I thought I would help the VICfolk in finding appropriate holiday gifts. I did NOT realize what I was getting into—I found over 55 manufacturers and eventually looked at over 200 products. That's right, this column has 200 products listed and evaluated for your purchasing pleasure. Doing this took nearly a man-month of my time, so this folly will not be repeated.

First, some comments concerning the evaluations. A fair and complete evaluation of each product was impossible to do. Instead, I took a brief look at each product and used it for a few minutes. In most cases this was enough to assign a Stars rating to the item—my six years in the PET world has acquainted me with most of the varieties of software, so getting the 'feel' of a product by taking a brief look is more accurate than you might think.

The Stars ratings work about like this:

6 Stars: This is an incredibly well done and superb product. If you have any interest at all, get it.

5 Stars: This is a well done product. You will enjoy its use and the style is good also, so understanding it is not a problem.

4 Stars: A solid product though it could be improved.

3 Stars: This will do the job and is quite adequate. In some cases the product is good, but not very interesting.

2 Stars: This product works ok, but there's no reason to get it unless it fits your needs.

1 Star: Either the idea is poor, the execution shows a total lack of style or knowledge of the VIC, or the product has serious bugs or shortcomings. Use only if you are desperate.

No stars: Hopelessly bad or has catastophic bugs.

Now, I am not an objective reviewer. In fact, my 'hidden agenda' is probably longer than yours. I can describe a few prejudices, so here goes: First, the VIC is a small machine, and many applications, particularly business and education are very, very hard to do on an unexpanded VIC. That's why the cartridges and programs requiring memory expansion tend to do better. In fact, education is the *hardest* area to do good software for, and business is the *second hardest* area. Games lie in the middle and physical hardware is also medium in difficulty.

Third, I look for style, creativity and usefulness. A product that is adequate tends not to be seen, and you will find these at two and three stars. If a product does not really use the VIC's facilities, I get bored. Fourth, I am intolerant of poor or boring programs being fobbed off as educational or business applications and will not accept the excuse that," well, It's for children."

Lack of space prevents me from giving any mini-reviews of the top 20 products —doing so would double the length of this column. However, here are a few notes to consider while browsing through the lists:

1. If two products in the same category have the same number of stars, the product listed first is somewhat better. For example I consider *Chomper* better than *Trashman* in Figure 1.
2. 8K RAM refers to having the 3K or 8K expansion cartridge mounted in the VIC. Some programs will require one or the other specifically. If it is a business program, the 8K or 16K or 24K will suffice.
3. Get a joystick.
4. Read the Manufacturer's Code carefully. The Manufacturer's List is arranged in the order of the Codes which is not quite alphabetic.
5. *Astroblitz* is far and away the best cartridge game. It requires a joystick.
6. Vic Forth is the FORTH language, which is for those involved in programming work. FORTH is fascinating, but not for the casual user.
7. *Chomper, Snakman* and *Trashman* are variations on *Pac-Man*.
8. The *VIE* and *Promqueen* are for really serious VIC users.
9. If you buy something based on these lists, let me know how it all came out for you.

Figure 1. The Top 20 VIC Products.

Rank	Stars	Product Name	Price	Manufacturer	Type
1	******	Astroblitz	$ 46.95	CSW	Game Cartridge
2	******	VIC Forth	$ 59.95	HES	FORTH in Cartridge
3	*****	Alphacom Printer	$219.00	ALP	40 col Printer
4	*****	Defender on Tri	$ 12.95	NUF	Game Tape
5	*****	Chomper	$ 12.95	RAC	Game Tape
6	*****	Trashman	$ 46.95	CSW	Game Cartridge
7	*****	Hopper	$ 12.00	DES	Game Tape
8	*****	Snakman	$ 24.95	MDG	Game Tape
9	*****	VIE (IEEE-488)	$ 79.95	MCS	Interface Cartridge
10	*****	PromQueen	$174.50	GCB	Development Cartridge
11	*****	Terminal 40	$ 29.95	MMA	Terminal Tape
12	*****	Public Domain Vic	$ 10.00	PUD	80 Progs on Tape
13	*****	HesWriter	$ 39.85	HES	Wordproc Cartridge
14	*****	BUTI	$ 34.95	UMI	Utility Cartridge
15	*****	VIC Carrying Case	$ 89.95	CAY	VIC Suitcase
16	****	Softpedal	$145.00	PAC	Exercycle system
17	****	Printor	$ 49.95	UMI	RS 232 Interface
18	****	Expandor	$ 59.95	PTI	3 Slot Motherboard
19	****	Turtle Graphics	$ 39.95	HES	Turtle Cartridge
20	****	Typing Tutor	$ 9.95	ACS	Educational Tape

Figure 2A. Cartridges.

VIC Cartridges - Games and Entertainment

Rating	Product Name Description of Product	Needs	Price	Mfr. Code
******	Astroblitz An excellent arcade game similar to 'Defender'	Joystick required	$ 46.95	CSW
*****	Trashman Variation of PacMan using garbage trucks & big California flies	Joystick optional	$ 46.95	CSW
****	Aggressor Similar to 'Defender' arcade game	Joystick optional	$ 39.95	HES
****	Sargon II Plays chess on the VIC - reasonably well	Joystick optional	$ 39.95	CSJ
****	Black Hole Shoot down debris near a Black Hole without falling in	Joystick optional	$ 46.95	CSW
****	Satellites & Meteorites Like asteroids with more interesting goodies to shoot at	Joystick optional	$ 49.95	UMI
****	Renaissance Plays a hard game of Othello, choice of level of play	Joystick optional	$ 49.95	UMI
****	Cloudburst Destroy nasty stuff falling from clouds before they zap you	Joystick optional	$ 39.95	UMI
****	Radar Rat Race Move a mouse thru a maze, eat cheese, avoid cats and rats	Joystick optional	$ 29.95	CBM
***	Super Alien Go about a maze and trap aliens	Joystick optional	$ 29.95	CSJ
***	VIC Avenger Space Invaders in color for the VIC	Joystick optional	$ 29.95	CBM
***	Jupiter Lander Like Lunar Lander with some extensions	Joystick optional	$ 29.95	CSJ
**	Road Race Like the 'Night Driver' arcade game but not as good		$ 29.95	CBM
**	Poker Plays 5 card draw poker with limited betting options		$ 29.95	CBM
*	SuperSlot Simulates a Slot Machine - All you do is pull the handle	Joystick optional	$ 29.95	CBM

SRA Educational Courseware: "Because learning matters"

Computer Drill and Instruction: Fact Track™ (Grades 1-6)
For your Apple*, Atari*, IBM* and Radio Shack* personal computers.

Fact Track gives timed drill on the facts of addition, subtraction, multiplication, and division and reports student speed and performance. Choice of difficulty level. Choice of competitive or noncompetitive format. Choice of drill type: facts, mixed practice with facts, extension skills. Binder with Diskette and Teacher Guide, $100.00.

*Registered trademarks.

☐ Yes! I want Fact Track!
Please contact me immediately.
☐ Send me literature about Fact Track.

Name
School
Address
City, State, Zip
Telephone

For faster service, call SRA toll-free:
(800) 621-0476
Or mail this coupon to:

SRA®

SCIENCE RESEARCH ASSOCIATES, INC.
155 N. Wacker Drive, Chicago, Il. 60606

CIRCLE 334 ON READER SERVICE CARD

Maxell Floppy Disks

The Mini-Disks
with maximum quality.

Dealer inquiries
invited. C.O.D's
accepted. Call
FREE (800) 235-4137.

PACIFIC EXCHANGES
100 Foothill Blvd., San Luis
San Luis Obispo, CA 93401.
In Cal. call (800) 592-5935 or
(805)543-1037.

CIRCLE 262 ON READER SERVICE CARD

DAISY WHEEL
TYPEWRITER/PRINTER
SMITH CORONA® ULTRASONIC™
Use with CBM®, PET®, APPLE®, VIC®, ATARI®, TRS-80®, OSBORNE-1®, IBM®
Excellent typewriter with automatic lift-off correction; changeable daisy print wheels only $4.95; 120 words per minute. ***Uses same print mechanism as Smith-Corona® TP-1™.*** *Rugged carrying case included.*

$799.00

TP–1 TEXT PRINTER $599.00
CENTRONICS PARALLEL

BUSINESS MACHINE CONSULTANTS
Mailing address:
1735 N. Broadway - Walnut Creek, CA 94596
415-930-9600

CIRCLE 131 ON READER SERVICE CARD

SOFTWARE FOR TRS-80 I + III

PEDESTRIAN
CRASH-OUT
LEM I
ADDRESS FILER
FINANCE
MATH SKILLS

MORE SOFTWARE AVAILABLE SOON FOR THE *TRS-80* AND *SINCLAIR ZX81*.

WRITE FOR YOUR **FREE** CATALOGUE TO:

DDL SOFTWARE, INC.
PO BOX 116
WESTTOWN, PA. 19395

TRS-80 IS A REGISTERED TRADEMARK OF THE TANDY CORP. SINCLAIR ZX81 IS A REGISTERED TRADEMARK OF SINCLAIR RESEARCH, LTD.

CIRCLE 176 ON READER SERVICE CARD

PET/VIC, continued...

VIC Cartridges - Programming Tools

Rating	Product Name Description of Product	Needs	Price	Mfr. Code
******	VIC FORTH A complete FORTH with VIC extensions		$ 59.95	HES
*****	BUTI This is a 'Programmer's Toolkit' with some nice extensions Note: This is a ROM chip only - you have to mount it in a socket at $A000. UMI's socket cartridge goes for $ 29.95	See Note	$ 34.95	UMI
****	HESMON Monitor & debugging tools for machine language - like 'extramon'		$ 39.95	HES
****	Super Expander Adds 3K RAM plus sound & graphics commands to BASIC		$ 69.95	CSJ
****	Programmer's Aid 'Programmer's Toolkit' for the VIC		$ 59.95	CSJ
***	Machine Language Monitor ML Monitor - a bit overpriced - see HESMON which does more		$ 59.95	CSJ

VIC Cartridges-Miscellaneous

Rating	Product Name Description of Product	Needs	Price	Mfr. Code
*****	HESWRITER A surprisingly complete word processing cartridge	printer	$ 39.95	HES
****	Turtle Graphics Gives a 'turtle languge' for VIC. Not the LOGO standard turtle		$ 39.95	HES
***	Mole Attack An educational game for children - helps hand-eye coordination	Joystick optional	$ 29.95	CSJ

Figure 2B. Hardware.

VIC Hardware - Peripheral Devices

Rating	Product Name Description of Product	Needs	Price	Mfr. Code
*****	AlphaCom VIC Printer Low cost fast 40 column thermal printer with full VIC graphics		$219.00	ALP
***	Commodore Datasette Tape cassette drive for VIC		$ 75.00	CSJ
***	Commodore Joystick Your standard joystick		$ 9.95	CBM
***	Commodore Paddles Two game paddles for joystick port		$ 19.95	CSJ
***	VicModem Modem plugs into User Port and Modular phone handset (Uses VICTerm 1 software which comes with modem)		$109.95	CSJ
***	VIC 1540 Single Disk Drive Disk drive uses CBM 4040 format		$599.00	CBM
**	Vic Light Pen Light Pen & demo programs - I find light pens a bit flakey to use		$ 39.95	SKY

VIC Hardware - Bus Expansion Boards

Rating	Product Name Description of Product	Needs	Price	Mfr. Code
****	CardBoard 6 slot expansion with select switches for 2 blocks Note: NO protection of traces from paperclips, etc		$139.95	CAR
****	Expandor 3 slot expansion board with switches for each slot		$ 59.95	PTI
***	Mini Mother A no-frills 3 slot expansion board		$ 69.95	QDI

Rating	Product Name Description of Product	Needs	Price	Mfr. Code
***	3 Slot Mini-Mother A no-frills 3 slot expansion board with plastic cover		$ 69.95	DES
***	The Programmer A no-frills 3 slot expansion coated with black paint insulation		$ 69.00	PAR
**	Expansion Mother Board 3 slot expansion - hard to insert but certainly inexpensive & has solder mask over traces		$ 39.95	SLA

VIC Hardware -Memory Expansion Cartridges

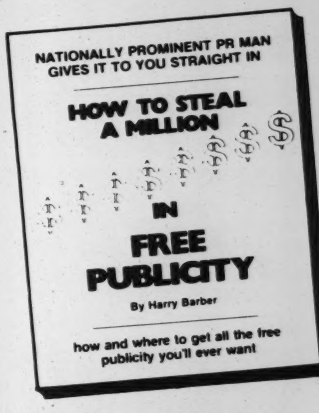
Rating	Product Name Description of Product	Needs	Price	Mfr. Code
****	24K RAM 24K ram cartridge		$145.00	MCS
****	24K Memory Expansion 24K ram - has low power consumption		$169.95	SLA
****	VIM-16 by Microtek 16K memory expansion with address switches & ROM/EPROM insertability		$129.95	SKY
***	VIC 16K Memory Expander Cartridge 16K ram cartridge - hard to get inside to address switches		$109.95	SKY
***	VIC 3K Memory Expander Many, many games tapes dislike this cartridge		$ 39.95	SKY

VIC Hardware - RS-232 Interfaces

Rating	Product Name Description of Product	Needs	Price	Mfr. Code
****	Printor True RS 232 levels, good instructions		$ 49.95	QDI
****	RS232C Terminal Interface True RS 232 levels in this interface by Commodore		$ 49.95	CSJ
**	V232 True RS232 levels, but no protection from shorts and mounting of some components may lead to breakage		$ 45.00	MCS
*	MDM-1 Two plugs for modem & printer. TTL levels only. Internal construction is very shoddy & hard to repair		$ 62.00	RVR
*	MDM-2 One plug for modem. TTL levels only. This is a kit - if you buy the assembled version it is put together with some IC pins not soldered.		$ 31.00	RVR

VIC Hardware - Unique Items

Rating	Product Name Description of Product	Needs	Price	Mfr. Code
*****	VIE Cartridge which provides a true IEEE-488 interface. This lets the VIC connect to any standard PET/CBM peripheral. Very handy for VIC product development people		$ 79.95	MCS
*****	Promqueen Eprom burner with 4K ram & eprom with burn code & hex editor Note: 4K ram allows access by external cpu for emulation & development work		$174.50	GCB
****	40/80 Video Combo Package 16K ram plus 40 & 80 column video converter Note: Video is black & white. In 80 col mode you need a monitor Display is 24 lines high, not 25 as in PET/CBM		$299.95	QDI
****	HESCOM A cable to connect VIC User Port to PET/CBM User Port and software to handshake data between the two. Useful for developing VIC programs when your best tools are on your PET.	Standard PET/CBM	$ 49.95	HES
****	A/D/A - Converter 8 channel 8 bit A/D, 1 channel 8 bit D/A on 0-5v range Software driven SAR/comparator for A/D		$129.95	MWE


NATIONALLY PROMINENT PR MAN
GIVES IT TO YOU STRAIGHT IN
HOW TO STEAL
A MILLION
$
IN
FREE
PUBLICITY
By Harry Barber
how and where to get all the free publicity you'll ever want

This remarkable book shows you...

- How to professionally prepare news releases and articles so they will be accepted by the media.
- How to develop your mailing lists.
- How to work with the news media.
- How to measure the effectiveness of your publicity
- Dozens of ways to secure additional publicity at nominal cost.
- Over 600 outlets for free publicity and reference to thousands of additional sources.

In this comprehensive publicity guide, Harry Barber eliminates the mystique of "free publicity"– shows you in detailed, step-by-step procedures, how and where to get it all the free publicity you'll ever want for yourself or your organization.

How To Steal A Million $ In Free Publicity is the ideal reference guide for business owners, corporate executives, political groups, non-profit organizations, and individuals in all walks of life.

About the author—
Nationally prominent advertising and public relations executive, Harry Barber, gives it to you straight in his latest book.

The author has developed hundreds of publicity campaigns in conjunction with screen and television personalities, US Astronauts, USAC Racing, major corporations, and private individuals.

Only $14.95 postpaid
SATISFACTION GUARANTEED!

Success Sellers
Publishers & Booksellers
P.O. Box 16801
Irvine, CA 92713

Please rush me a copy of Harry Barber's book, *HOW TO STEAL A MILLION $ IN FREE PUBLICITY*. I enclose $14.95.

Name ____________
Address ____________
City ____________
State ________ Zip ________
CC-3

CIRCLE 344 ON READER SERVICE CARD

SOFTWARE TREE
PROUDLY PRESENTS
CORPORATE STRATEGY
THE GAME OF MAKING MONEY IN BUSINESS!

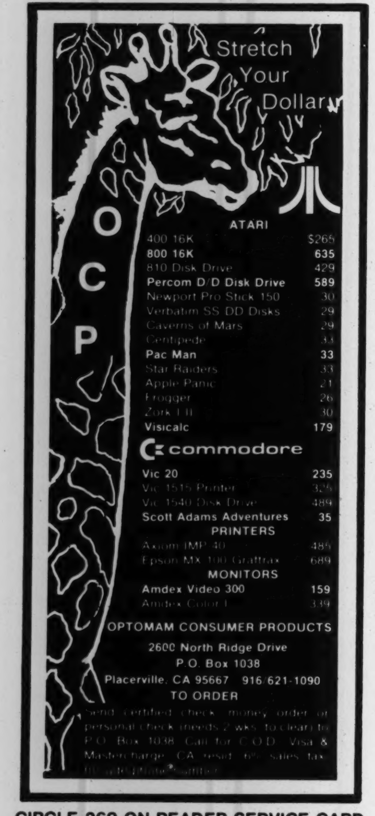
YOU ARE THE TOP EXECUTIVE OF A COMPANY THAT BUILDS ROBOTS. IT IS YOUR JOB, AS WELL AS YOUR OPPONENTS, TO BUY AT LOW PRICES AND SELL AT HIGH PRICES TO MAKE MONEY. SUPPLY AND DEMAND AT ITS BEST. FOR 2 TO 6 PLAYERS.

PRICES: APPLE II APPLESOFT, DOS 3.3 32K
ATARI 400/800 DOS 2.1 32K
COMMODORE/PET 16K
DISK - - $29.95
ATARI 400/800 16K, COMMODORE/PET 16K
CASSETTE - - $21.95
CALIF. RESIDENTS ADD SALES TAX
MAKE CHECK/MONEY ORDER
PAYABLE TO:

SOFTWARE TREE
P.O. BOX 51354
SAN JOSE, CA 95151 - 5354

ATARI, APPLE II AND COMMODORE/PET ARE TRADEMARKS OF ATARI INC., APPLE COMPUTERS AND COMMODORE BUSINESS MACHINES.

CIRCLE 328 ON READER SERVICE CARD



Stretch Your Dollar

O C P

ATARI
400 16K $265
800 16K 635
810 Disk Drive 429
Percom D/D Disk Drive 589
Newport Pro Stick 150 30
Verbatim SS DD Disks 29
Caverns of Mars 29
Centipede 33
Pac Man 33
Star Raiders 33
Apple Panic 21
Frogger 26
Zork I II 30
Visicalc 179

commodore
Vic 20 235
Vic 1515 Printer 325
Vic 1540 Disk Drive 489
Scott Adams Adventures 35
PRINTERS
Axiom IMP 40 485
Epson MX 100 Graftrax 689
MONITORS
Amdex Video 300 159
Amdex Color I 339

OPTOMAM CONSUMER PRODUCTS
2600 North Ridge Drive
P.O. Box 1038
Placerville, CA 95667 916/621-1090
TO ORDER
Send certified check, money order or personal check (needs 2 wks. to clear) to P.O. Box 1038. Call for C.O.D. Visa & Mastercharge. CA resid. 6% sales tax. [illegible]

CIRCLE 260 ON READER SERVICE CARD

PET/VIC, continued...

Rating	Product Name	Price	Mfr. Code	Description of Product
**	Prototype / Experimenter's card for VIC	$ 18.95	ELC	Kludge card for EE types to fit in VIC. Note: There is a standard Vector prototyping card for about $13.00 which works quite well if you have wire-wrap tools or Flea Clips. Available at most electronic parts stores

VIC Books & Magazines

Rating	Product Name	What	Price	Mfr. Code	Description of Product
****	VIC Revealed by Nick Hampshire	book	$ 14.95	SKY	Inner details of VIC for machine language hackers & advanced programmers
****	VIC Computing	magazine	$ 30.00	VCC	Monthly magazine from England on VIC $30/yr
****	The TORPET	magazine	$ 20.00	TOR	Toronto PET User's Group - has lots on VIC $20/yr
****	COMPUTE!	magazine	$ 20.00	CPU	General PET/ATARI/APPLE magazine with VIC articles $20/yr
***	Power / Play	magazine	$ 10.00	CBM	Commodore's VIC users magazine $10/yr
***	Understanding Your VIC, Volume I	book	$ 11.95	TIS	Beginning & intermediate VIC BASIC programming
***	VIC 20 Programmer's Ref Guide	book	$ 16.95	CSJ	Commodore's advanced book on VIC
***	VIC-20 Interfacing	booklet	$ 14.95	MSG	Book of electronics projects for VIC. Assumes some electronics experience
*	Personal Computing on VIC 20	book	$ 5.95	CBM	You got this one when you bought the VIC

VIC Unique Items - Not Easily Classified

Rating	Product Name	What	Price	Mfr. Code	Description of Product
*****	VIC Carrying Case		$ 89.95	CAY	A nice suitcase sized case for VIC, power supply, rf mod, tape unit & space for manuals and paperwork. (Note: A larger case to include disk & printer is also available.)
****	SoftPedal	VIC exercycle	$ 145.00	PAC	A stand with fan converts your bike to an exercise bike. Sensor and software uses VIC for pacing, mileage, etc. Software could be improved to make this a 5 star product.

Figure 2C. Useful Software.

NOTE: All Software comes on cassette tape unless indicated otherwise.
Some vendors offer both tape & disk versions.

VIC Software - Educational

Rating	Product Name	Needs	Price	Mfr. Code	Description of Product
****	Typing Tutor		$ 9.95	ACS	Touch typing drill for the VIC - from easy keys to whole keyboard in many gradual steps
***	Touch Typing Tutor		$ 15.95	TAY	Teaches touch typing but word generation is random and not like actual text
***	Stakeout	8K ram, Joystick req	$ 14.95	TAY	The 'capture boxes' pen & pencil game
***	Frog		$ 17.95	MCP	The PET bug eating frog - for young children

Rating	Product Name Description of Product	Needs	Price	Mfr. Code
***	Banner / Headliner Printer banners & headlines - no provision for non 80 col printer	80 col printer	$ 14.95	MMA
***	Street Maze Navigate a city via taxicab - relates street grid to giving directions		$ 7.95	CDS
***	Vixel # 1 Two games & a draw on screen program in Hi Res mode	Joystick optional	$ 12.95	CWK
***	Vixel # 2 Two more games & a custom character editor which could be used as a programming tool	Joystick optional	$ 12.95	CWK
***	Scramble 1 & 2 Unscramble words. Scramble 2 for 2 players		$ 19.95	COB
***	Flashcard Maker & Quiz Make flashcards and quiz with them on the VIC		$ 9.95	ACS
**	Lox 'Bagels' for the VIC		$ 6.95	COB
**	1,2,3 / Spelling Bee Hangman and Bagels games		$ 19.95	COB
**	Flash 'N Spell Flashcards oriented towards spelling drill		$ 15.95	QMX
**	Word Invaders Typing practice - goes with Typing Tutor by ACS		$ 8.95	ACS
**	English Invaders Shoot invading words by identifying noun, verb or adjective		$ 7.95	CDS
**	Hang-U Hangman using rather hard words		$ 12.00	DES
**	Educational / Recreational Pack I Three rather simple games & drills		$ 14.95	CSW
*	Gotcha Math Somethng will eat you if you don't do your math in time		$ 9.95	CDS
*	Hangman The familiar guess the word game		$ 8.95	ACS
zero	VIC Lemonade Our dull little lemonade stand is now on the Vic		$ 14.95	TAY

VIC Software - Business and Home

Rating	Product Name Description of Product	Needs	Price	Mfr. Code
*****	Terminal 40 Simply the best & nicest VIC as terminal program I have seen <<< Definitely a nice program >>>	8K ram, RS 232	$ 29.95	MMA
****	Tickertape Smooth scrolling horizontal display of messages		$ 14.95	MMA
****	Data Manager A simple & usable data base Disk version avail	8K ram	$ 19.95	MSP
***	Universal Mailing List Mailing list or simple data base Disk version avail	printer	$ 39.95	COB
***	Viterm A Your basic terminal processing program - limited to 300 baud	RS 232	$ 19.95	UMI
***	Data Handler (word processor) A badly named word processor - when entering answers to questions there are no defaults - which can catch you!	8K ram, printer	$ 17.95	MWS
***	Word Processor Small word processor	8K ram	$ 30.00	ISW
***	CopyCalc Perhaps the world's smallest 'VisiCalc'	8K ram	$ 14.95	ISW
***	Loan Analyser Two programs which analyse simple loans Disk version avail		$ 14.95	CSW
***	Household Finance Four programs for home budgeting Disk version avail		$ 34.95	CSW
***	Home Inventory Two programs to inventory & valuate your material things		$ 19.95	CSW
***	Car Costs Two programs to journal automotive things		$ 19.95	CSW

EARLY GAMES
FOR YOUNG CHILDREN

Nine educational and entertaining games controlled by a single program. Even very young children can select a game, play it, and select a different game...ALL BY THEMSELVES!

- PICTURE MENU GIVES CHILDREN CONTROL
- MATCH NUMBERS AND LETTERS
- COUNT COLORFUL BLOCKS
- ADD AND SUBTRACT STACKS OF BLOCKS
- LEARN THE ALPHABET
- PRACTICE SPELLING NAMES
- COMPARE SHAPES
- DRAW AND SAVE COLORFUL PICTURES

The large numbers and letters fill the screen with color. Children enter single key stroke responses and get immediate visual and musical feedback. Hints are provided when appropriate. Beyond just teaching children basic skills, EARLY GAMES makes them feel comfortable as they control the computer. Designed for children ages 2½ to 6 years old.

EARLY GAMES offers the child a diverse selection of activities which stimulate the process of problem solving as well as foster individual creativity.
Pamela Bach, Director
Youth World Day Care Center

I took EARLY GAMES home for my kids and they really liked it! It held their attention and they learned from it!
Jeannette Fritze
Computer Saleswoman

EARLY GAMES can help children learn new concepts, information, and skills and also introduce them to the joys and benefits of home computers.
Peter Clark, faculty
Institute of Child Development
University of Minnesota

All nine games for $29.95
(Minnesota residents add 5% sales tax)

IBM Personal Computer,
Apple II Plus
TRS-80 Color Computer 16K Disk or Cassette
Model I and III 32K Disk or 16K Cassette

VISA/MasterCard

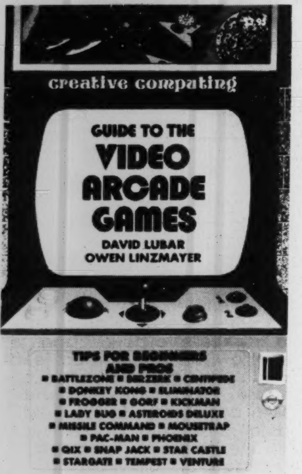
LEARNING TOOLS INC
educational software
Suite 140A
Shelard Plaza North
Minneapolis, MN 55426
1-800-328-1223
Minnesota residents call:
612-544-4720

CIRCLE 220 ON READER SERVICE CARD

BEAT COIN-OP ARCADE GAMES

with the NEW

Creative Computing Guide to the Video Arcade Games!


creative computing
GUIDE TO THE
VIDEO ARCADE GAMES
DAVID LUBAR
OWEN LINZMAYER
TIPS FOR BEGINNERS AND PROS
BATTLEZONE ■ BERZERK ■ CENTIPEDE
DONKEY KONG ■ ELIMINATOR
FROGGER ■ GORF ■ KICKMAN
LADY BUG ■ ASTEROIDS DELUXE
MISSILE COMMAND ■ MOUSETRAP
PAC-MAN ■ PHOENIX
QIX ■ SNAP JACK ■ STAR CASTLE
STARGATE ■ TEMPEST ■ VENTURE

Here's the games book you've been waiting for—an all-new, field-tested guide full of savvy advice and sound tips on how to get the most from all those quarters!

The GUIDE TO THE VIDEO ARCADE GAMES is packed with detailed information on:

- Collisions
- Bonuses
- Rates of fire
- Wraparound
- Horizontal and vertical movement
- Distractions

—and much more! Whether you're a new convert or an old pro, you'll find a wealth of hard-won information, lavishly illustrated, to help you rack up record scores or prolong your games.

Save money on practice sessions and be the envy of your friends with the GUIDE TO THE VIDEO ARCADE GAMES. Use the coupon to order your copy today!

Only $3.95!

4³⁄₁₆" x 6⅞", softcover, 112 pages

creative computing Dept. HA2C
39 East Hanover Ave., Morris Plains, NJ 07950

Send me _____ copies of the GUIDE TO THE VIDEO ARCADE GAMES, at $3.95, plus $1 postage and handling,* each. (#14A)

☐ PAYMENT ENCLOSED $_______. (NJ residents add 5% sales tax.)

*All foreign orders (except Canada and Mexico) add $3 to postage and handling shown. Shipped air mail only.

☐ CHARGE MY:
☐ American Express ☐ MasterCard ☐ Visa
(Charge and phone orders: $10 minimum.)

Card No.______________ Exp. Date________
Signature______________________
Mr./Mrs./Ms.______________________
(please print full name)
Address______________________ Apt.____
City______________________
State________ Zip______________
Institutions only—purchase orders under $50 not accepted.

For faster service, **PHONE TOLL FREE: 800-631-8112.**
(In NJ call 201-540-0445)

PET/VIC, continued...

Rating	Product Name Description of Product	Needs	Price	Mfr. Code
**	Checkbook		$ 12.95	MIS
	Keeps checks register, comes in nice plastic binder w/ data tape too			
**	Home Calculation Program Pack		$ 59.95	CSJ
	Commodore's home finance, loans, expenses, etc			
**	V-Data Base / V-Mail		$ 29.95	MWE
	Very limited data base programs - comes with disk version too			
**	Word Vic	8K ram	$ 19.95	ELC
	A very small word processor			
**	Un-Word Processor		$ 14.95	MMA
	A minimal limited word processor			
*	Terminal 22	RS 232	$ 14.95	MMA
	This would rate 3 stars but I couldn't xmit control characters			
*	Budget II	8K ram	$ 9.95	RAK
	Like CSW's Home Finance - but printer's output gave me nonsense			
*	Name & Address		$ 5.95	RAK
	Enter & recover mailing information			
zero	Portfolio Manager	8K ram	$ 19.95	MSP
	Enter & recall securities info - this pgm has some bad bugs			
zero	Club Lister		$ 13.95	TSA
	I could have written this program in the time it took to LOAD it			
zero	Dear Diary		$ 12.95	TSA
	ditto, maybe less time			
zero	Mortgage Comparer		$ 8.95	TSA
	CSW's Loan Analyser & a pencil gives you more			
zero	Savings Account		$ 13.95	TSA
zero	Home Budget		$ 12.95	TSA
	*** At this point I quit looking at TSA's demo tape for it was all the same kind of junk. Avoid this vendor!			
zero	Mailing List Program	8K ram, Disk req	$ 24.95	SPE
	Probably a nice program but I couldn't follow the directions and it didn't work the way it said it would. I couldn't enter a name for all of my efforts			

VIC Software - Programming Tools

Rating	Product Name Description of Product	Needs	Price	Mfr. Code
****	Graphics Designer		$ 14.95	MMA
	Editor for design of custom character sets			
****	Assembler		$ 24.95	FSS
	Editor, Assembler, Loader - does syntax check on entry & source code is compacted to allow longer programs then HES. However, the MOS addressing conventions are NOT followed and it does not like spaces after the opcode when entering source code			
****	HIRES / Multicolor		$ 25.00	ABA
	Two programs to use VIC's high resolution and multicolor modes These are 'wedges' so you can write BASIC programs with the plotting commands included			
****	Graph VICS	8K ram	$ 25.00	ABA
	HIRES & Multicolor combined for VICs with more memory. Permits full VIC screen in HiRes mode			
***	HES Assembler & Editor		$ 23.95	HES
	Text editor makes source files for Assembler & loader			
***	Minimon 6747		$ 15.95	QMX
	Machine Language Monitor			
***	Vic Dis		$ 9.95	ACS
	Disassembler of machine language			
***	Disassembler		$ 14.95	MMA
	Disassembles ROMs, space limits awkward for other code			
***	Graphics Menagerie		$ 11.95	MMA
	Several graphics demos & explanations			
***	VIGIL	8K ram	$ 35.00	ABA
	A mini-language for games. The demos all used quarter square graphics and seemed taken from the RCA VIP. Code written in VIGIL is very hard to read. Not much faster than BASIC			

Rating	Product Name Description of Product	Needs	Price	Mfr. Code
##	HES Plot Plot in Hi Res mode. Instructions hard to follow		$ 15.95	HES
##	HES Count Generates various statistics on your BASIC programs	8K ram	$ 23.95	HES

VIC Software - Unique Items

Rating	Product Name Description Of Product	Needs	Price	Mfr. Code
#####	Public Domain VIC Collection #1 Some 80 programs on tape or disk. These are public domain programs collected from various user's groups with widely varying quality. >>> This is a bargain you can't ignore! <<<<		$ 10.00	PUD
###	PIPER Compose & play music on the VIC Disk version avail Note: This program fits Educational and Programming categories too		$ 25.00	ABA
##	Ham Antennas Computes dimensions for ground plane, dipole and yagi antennas given frequency. RAK has many other small programs for the radio ham.		$ 5.95	RAK
##	Morse Code Trainer Practice on recognition of Morse Code Note: Nobody has made a 'Send Morse Code' training program which can be easily done for 5 - 20 wpm		$ 19.95	TAY
##	CW Trainer / Speedometer Recognize Morse code - letters and messages		$ 15.95	RAC
##	Aerobics Points Calculator If you exercise this counts 'aerobics points' which appeals to the number-minded exerciser. I am not sure of all this but you can try it out. Disk version avail		$ 24.95	TAY

Figure 2D. Game Tapes.

NOTE: All Software comes on cassette tape unless indicated otherwise.
Some vendors offer both tape & disk versions.

VIC Software - Games and Entertainment

Rating	Product Name Description of Product	Needs	Price	Mfr. Code
#####	Defender on Tri Fly rescue ship thru several lethal mazes	3 or 8K memory, Joystick opt	$ 12.95	NUF
#####	Hopper Hop a Froggie across roads, meadows & other things	Joystick required	$ 12.00	DES
#####	Chomper Essentially Pac Man - with the best graphics	Joystick required	$ 12.95	RAC
#####	Snakman Fast version of Pac Man	Joystick optional	$ 24.95	MDG
####	Mad Painter You could call this a 'reverse Pac Man', sort of - but it's fun!	Joystick required	$ 9.95	WUN
####	BOSS Plays chess with some nice features	8K memory card	$ 39.95	DES
####	The Cube Simulates Rubik's cube - shows all faces & uses standard notation		$ 15.95	QMX
####	Lunar Command Rescue Astronauts while flying through tumbling meteor fields		$ 16.00	DES
####	Night Rider The arcade game 'Night Rider'		$ 12.95	VSI
####	VIC PICS 19 High resolution pictures for your VIC		$ 18.95	MMA
####	Sub Chase Drop depth charges from destroyer & avoid mines from submarines	Joystick optional	$ 14.96	UMI
####	Maze Solve a maze from a rat's eye view	Joystick optional	$ 12.95	VSI

Symtec Hi-Res Light Pen for IBM PC, Apple II Plus, Atari 800, VIC-20

Thousands of pens in use by personal computer users and corporate users such as American Heart Association, U.S. Military, Ford Motor Company, and Educational Institutions of all levels.

Pen reads coordinates over the entire screen. Touch-tip or Push tip models available. Uses range from videodisc and computer training, to simple menu selection to computer games. Apple pen works with Stoneware, Inc. new graphics processing system and Apple Super Pilot.

Apple $250/IBM, Atari, VIC $150
Available at Computer Stores worldwide or contact us directly:

SYMTEC®

THE LIGHT PEN PEOPLE

15933 W. 8-Mile Detroit, MI 48235 (313) 272-2950

IBM, Apple, Atari, VIC are registered trademarks.

CIRCLE 347 ON READER SERVICE CARD

CHRISTMAS GIFTS FOR THOSE WHO COMPUTE

More and more people are becoming involved with computers. If you know someone who is, here are some special gifts that will make a great hit this Christmas:

- T-shirts
- Coffee mugs
- Buttons
- Bumper stickers
- Personalized brass name plates for your computer

. . . AND MORE . . .

All with colorful designs and your choice of computer phrases.

For a more detailed description, call or write today for a free brochure:

Sculpture by Softouch
P.O. Box 754-C, Bonita, CA 92002
714/475-2268

Please send me your free brochure
Name ____________
Address ____________
____
City ____________
State ________ Zip ______

CIRCLE 307 ON READER SERVICE CARD

Spread Sheet Templates for VisiCalc® Users.

Business SpreadTemps™ are special application templates for use with your VisiCalc® program - to help you customize programs for your own special business requirements. Insert rows and columns, change labels, edit, or replicate formulae. No special programming knowledge is necessary.

ExecSystems Software™ offers you a variety of detailed templates on each diskette. Each of the following Business SpreadTemps™ will greatly expand the power of VisiCalc® for your business!

VT 210
BusinessTemp™ One
Provides you with a selection of professionally formatted reports and analyses. Included are reports and analyses for cash flow, break-even, sales, contracts bidding, sales goals, checking accounts, and inventory.

VT 220
BookeepingTemp™
This "template" is a complete bookkeeping mini-system for the small business. You and your accountant will be provided with important specific and overall financial information regarding cash receipts, cash disbursements and banking reconciliations. Easy to use and more reasonable in price than other database oriented accounting packages, you can easily use VisiCalcs® powerful DIF (Data Interchange Format) commands for interactive bookkeeping.

VT 230
BusinessTemp™ Two
Add a powerful analysis tool to your business. This "template" includes Profit/Loss Analyses, Budget Planning, Operating Cost Analysis, Job Control and other templates to assist the business manager in today's demanding business environment.

VT 240
FormsTemp™ for Business
Enhance your business operations with a complete library of common business forms including; invoices, memos, receipts, packing lists, reminders, schedules, price lists, and more. Use the DIF command to interact the forms with other business templates!

VT 250
AppoinTimeTemp™
Maintain efficient appointment schedules, time records, and time analyses for you, managers, and executives. Analyze the time effectiveness of the tasks being performed in various organizational environments - individually or in groups.

VT 260
ReportTemp™ for Business
An advanced report system including report formats, analyses, and analyses algorithms for significant manager and executive level decision information.

All SpreadTemps™ require APPLE II System (min. 48K) and the VisiCalc® Program.

SpreadTemps™ are NOT write-protected.

Business SpreadTemps™ are available on diskette at only $38 each. **Or you may save $51 by buying all six "templates" for only $175.** (Complete package includes extras such as full size printed general manual and examples in a full size 3-ring notebook. Postage and handling is also included.)

ExecSystems Software™
P.O. Box 192
Clinton, MD 20735
(301) 856-1180

Visa and Mastercard welcome.
Please add $1.50 postage and handling for individual diskette orders. (Postage included in package price.)
Maryland residents add 5% Sales Tax.

CIRCLE 372 ON READER SERVICE CARD

PET/VIC, continued...

VIC Software - Games and Entertainment

Rating	Product Name Description of Product	Needs	Price	Mfr. Code
***	Munchmaid Pac Man again	8K ram Joystick req	$ 12.95	WUN
***	Space Rescue Go thru lethal maze to save spaceman	Joystick req	$ 9.95	WUN
***	Air Strike Drop bombs on a tank - Clean graphics & nice sound		$ 11.00	DES
***	Grave Robbers A 'graphic adventure' in a graveyard		$ 13.95	VSI
***	Trek The classic 'Startrek' game for the VIC		$ 12.95	VSI
***	Rescue From Nufon Go from room to room rescuing people & avoiding aliens	Joystick optional	$ 9.95	NUF
***	3-D Labyrinth Go thru Rat's Eye view of a maze		$ 12.00	DES
***	City Bomber / Minefield Bomb buildings before you hit them / Deduce where mines are or die		$ 23.95	CSW
***	Vic Pack II Slalom/Othello/Meteors - Meteors is by far the best one		$ 24.95	SKY
***	Krazy Kong Rescue maidens, hop over barrels and avoid Kong	Joystick optional	$ 9.95	NUF
***	Maelstrom Vaguely like 'Centipede'	Joystick required	$ 7.95	CDS
***	Quirk Try to get up a maze with a lot of moving holes in the floor	Joystick required	$ 9.95	NUF
***	Dodge Car Drive down road and miss stalled cars	Joystick optional	$ 9.95	NUF
***	Snake Snake about, growing longer when you eat things	Joystick required	$ 9.95	WUN
**	Depth Charge Drop those pills on dem submarines		$ 9.95	RAC
**	Gold Brick Snake about eating gold bricks & avoid self		$ 14.00	DES
**	Computer Baseball Play baseball by selecting characteristics of players for both teams		$ 11.95	PRS
**	Cosmic Debris Shoot at downfalling aliens		$ 14.95	VSI
**	Tank Wars Take out enemy tank who mirrors your moves amid trees, lake, mines	Joystick optional	$ 17.95	HES
**	Its A Living Catch those bombs from 4 conveyer belts		$ 9.95	WUN
**	Skiing Ski down hill avoiding trees, ice & eating goodies		$ 9.95	WUN
**	Skier Ski down a hill avoiding pitfalls	Joystick optional	$ 17.95	HES
**	Kosmic Kamikaze Shoot at aliens & avoid mother ship	8K ram Joystick opt	$ 24.95	UMI
**	Super Trek Your basic 'Startrek' in strange colors	8K ram	$ 9.95	TEL
**	Adventure Pack I Three tiny adventures - not easy!		$ 14.95	VSI
**	Fuel Pirates This one is simply not describable		$ 15.95	HES
**	Recreation Program Pack Six games (2 are educational) from Commodore		$ 59.95	CSJ
**	Escape Get out of rat's eye maze using N S E W		$ 9.95	NUF
**	VIC Pack III Indi500/Convoy/Gunfight - all ho-hum		$ 24.95	SKY
**	VIC Trek A minimal 'Startrek' game for the VIC		$ 17.95	HES
**	VIC Trek Another 'Startrek' - colors used make for hard reading		$ 7.95	CDS
**	Baseball Strategy Simulate baseball game by choosing type of pitches & batting		$ 12.00	DES

Rating	Product Name Description of Product	Needs	Price	Mfr. Code
**	Convoy Raider Select strategies as a sub commander attacking convoy		$ 11.95	PRS
**	Boxer's Corner Select qualities of boxers who then slug it out		$ 11.95	PRS
**	Action Games Pack Three marginal games Trap/Seawolf/Bounceout		$ 24.95	CRS
*	VIC Pack I VicVader/UFO Attack/Slot	Joystick 4 Vicvader	$ 24.95	SKY
*	Adventure Pack II Three more tiny adventures - very hard to get out of first room		$ 14.95	VSI
*	Convoy Escort Converse of Convoy Raider - now you are the escort		$ 11.95	PRS
*	Star Defender Undynamic simulation of space battles		$ 11.95	PRS
*	Treasures of The Bat Cave Go around rat's-eye maze looking for gold & avoiding dumb bats		$ 14.95	VSI
*	VIC-Yahtzee Plays and scores Yahtzee - minimal program		$ 12.00	DES
*	Gobbler Chase a gobbler - gobble gobble		$ 9.95	DES
*	Boxing 2 player game - operate boxers		$ 11.00	DES
*	Tic Tac Vic TicTacToe played perfectly so very boring		$ 9.95	ELC
*	A Maze Ing Move ball thru lethal maze		$ 12.00	DES
*	Simon Plays Simon similar to the toy Simon		$ 15.95	HES
*	Tank Invaders I really don't recall but it was a one star for sure		$ 9.95	RAC
*	Clowns Move seesaw to bounce clowns to pop balloons		$ 9.95	RAC
*	Target Zap 'Snake' done crudely		$ 9.95	TEL
*	Maze of Mikor Get through a maze and find treasure and kill monsters - unfortunately the maze is so dense you don't have a chance at all. Would get 2 or 3 stars if properly tuned ...		$ 17.95	HES
*	Star Fighter 'Star Wars' in slow time	Joystick required	$ 13.95	MSP
*	Attack on Silo III Shoot ICBMs at UFOs, slowly		$ 12.00	DES
*	Lazer Blitz Fly over UFO's & shoot them - the explosions are pretty	Joystick optional	$ 17.95	HES
*	Pak Bomber 'Ghost' drops eggs which you catch - way too hard to start with		$ 15.95	HES
*	Pinball Undexterous version of a pinball machine		$ 15.95	HES
*	Planet Lander Remake of PET Lunar Lander with gravity optional		$ 9.95	COB
*	Space Lander / Dots White Remake of PET Lunar Lander & a dull game		$ 7.95	DTC
zero	Breakaway Breakout - This one has the distinction of being the only game that requires the CBM paddles. Not that it made much difference - the ball mostly went through the screen's paddle anyways	Paddles required	$ 9.95	TEL
zero	Logic Games Only if you love MasterMind		$ 14.95	CSW
zero	Dungeons of Kal It just didn't work		$ 11.95	PRS
zero	Panzer Attack Shoot at turkeys (I mean tanks, sorry about that)		$ 14.00	DES
zero	Pedestrian Polo This one is definitely a turkey		$ 14.00	DES
zero	Robots It loaded & ran but nothing happened		$ 9.95	RAC

$$$ D/Punch? $$$

D/Punch Conversion Kits will help you **SAVE MONEY, SAVE STORAGE SPACE, SAVE TIME**. D/Punch Kits are engineered so you can quickly, accurately, & safely make alterations necessary to let you use both sides of your H or S sectored SINGLE-SIDED Diskettes. Converting 1 box of diskettes will more than pay for each D/Punch Kit. * Hub-Reinforcer Kit accurately positions Hub-Reinf. Ring to hub opening. * Disk-Sleeve lets you replace your lost or damaged sleeves. Indicate your system config. with order.

a. D/Punch Kit A — (5¼" drives & eq.) for ex. [Apple, Atari, CBM 4040, Franklin]	$ 6.95
b. D/Punch Kit B — (5¼" drives & eq.) for ex. [TRS 80 (Mod I, III), IBM, Osborne, Zenith]	14.95
c. D/Punch Kit C — (8" drives & eq.) for ex. [Altos, Zenith, TRS 80 Mod II]	16.95
d. Labels — [100 pcs]	3.00
e. Write-Protect Stickers — [100 pcs]	2.65
f. Hub-Reinforcer Kit (5¼")	10.99
g. Hub-Reinforcer Kit (8")	12.99
h. Hub-Reinforcer Rings (5¼") — [50 pcs]	5.85
i. Hub-Reinforcer Rings (8") — [50 pcs]	6.20
j. Disk Sleeves (5¼") — [10 pcs]	2.35
k. Disk Sleeves (8") — [10 pcs]	3.85

Add: $2 shipping & handling for each $15 order increment. AK, HI, & overseas cust.: write for S&H charges. MA res. add 5% tax. Send check or money order to:

D/Punch Co. (CC) 12
P.O. Box 201, Newton Hlds, MA 02161
Tel: (617) 964-2126 Telex: 4991009 CHTRI
©1982, D/Punch Corp., Pat. Pend.

CIRCLE 182 ON READER SERVICE CARD

TI USERS DISCOVER
Owerre!
Owerre Lake $20 Both
Gauntlet of Owerre $20 $30
LOWERRE LTD.
176 S. Lemon, Orange, CA 92666

CIRCLE 224 ON READER SERVICE CARD

MicRo Information Systems
a division of M-R Information Systems, Inc.
Presents Educational Software
designed to motivate the student.
(programs available for the TRS-80
Mod III* and VIC**)
Write for complete catalog, to:
M-R Information Systems, Inc.,
P.O. Box #73, Wayne, N.J., 07470
* TM Tandy, ** TM Commodore

CIRCLE 243 ON READER SERVICE CARD

FREE CATALOG!

Just let us know and we'll mail you a FREE *Creative Computing* Catalog – 16 pages filled with books, buyer's guides, magazines, and more!

To get your FREE catalog, write to: *Creative Computing* Catalog, Dept. HA1X, 39 East Hanover Ave., Morris Plains, NJ 07950.

Creative Computing
BUYER'S GUIDE TO PERSONAL COMPUTERS, PERIPHERALS AND ELECTRONIC GAMES
Send $5.00 ($3.95* plus
$1.05 postage and handling) to:
Creative Computing
Buyers Guide to Personal Computers
P.O. Box 640, Holmes, PA 19043
*NJ residents add 5% sales tax.
Outside U.S.A. $6.00.

Figure 3. Who Makes Them.

List of VIC Manufacturers.

Code	Name	Address	City	State	Zip	Phone
ABA	Abacus Software	PO Box 7211	Grand Rapids	MI	49510	616 241 5510
ACS	Academy Software	PO Box 9403	San Rafael	CA	94912	415 479 4703
ALP	Alphacom	2323 South Bascom	Campbell	CA	95008	408 559 8000
AMP	American Peripherals	122 Bangor Street	Lindenhurst	NY	11757	516 226 5849
CAR	Cardco	3135 Bayberry	Wichita	KS	67226	316 685 9536
CAY	Carry-Comp	24687 Aric Way	Elkhart	NY	46517	219 875 8698
CDS	Comm*Data Systems	PO Box 325	Milford	MI	48042	313 685 0113
CBM	Commodore	487 Devon Park Dr	Wayne	PA	19087	215 687 9750
CMT	Computermat	PO Box 1654	Lake Havasu City	AZ	86403	--- --- ----
COB	Computer Barn	319 Main St # 2	Salinas	CA	93901	408 757 0788
CPU	Compute!	PO Box 5406	Greensboro	NC	27403	919 275 9809
CPW	Computer Works	2028 West Camelback	Phoenix	AZ	85015	602 249 0611
CSC	Computer Service Centr	1115 Third St	San Rafael	CA	94901	415 453 6494
CSJ	Commodore Comp Center	930 Twn & Cntry Vill	San Jose	CA	95128	408 246 5710
CSW	Creative Software 201	San Antonio Cir#133	Mountain View	CA	94040	415 948 9595
CWK	Code Works	PO Box 550	Goleta	CA	93116	805 683 1585
DES	Data Equipment Supply	8315 Firestone Blvd	Downey	CA	90241	714 778 5455
DTC	DTC Software	PO Box 916	Janesville	WI	53547	608 752 3434
ELC	Elcomp Publishing	53 Redrock Lane	Pomona	CA	91766	714 623 8314
FSS	French Silk Smoothware	PO Box 207	Cannon Falls	MN	55009	507 263 4821
GCB	Gloucester Comp. Bus	6 Brooks Rd	Gloucester	MA	01930	617 283 7719
HES	Human Engn Software	71 Park Lane	Brisbane	CA	94005	415 468 4110
HYP	Hypertech 1820	NE 143 St Penths 7	Miami	FL	33181	--- --- ----
ISW	Intelligent Software	PO Box 3745	San Rafael	CA	94912	415 459 2905
MCP	Magic Carpet	PO Box 35115	Phoenix	AZ	80569	--- --- ----
MCS	Micro-Systems 11105	Shady Trail #103	Dallas	TX	75229	214 484 7836
MDG	Microdigital	752 John Glenn Blvd	Webster	NY	14580	716 872 0647
MIS	MIS	250 Fern Rock Way	Boulder Creek	CA	95006	408 338 9546
MMA	Midwest Micro Assoc	PO Box 6148	Kansas City	MO	54110	816 921 6502
MSG	Microsignal	900 Embarcadero #A	Goleta	CA	93117	--- --- ----
MSP	Microspec	2906 Ports O'Call Ct	Plano	TX	75075	214 867 1333
MWE	Micro World Electronix	6340 W Mississipi Av	Lakewood	CO	80226	303 934 1973
MWS	MW Software	PO Box 126	Urbana	IL	61801	217 356 7511
NUF	Nufenkop	PO Box 156	Shady Cove	OR	97539	503 878 2113
PAC	Practical App of Calif	PO Box 255768	Sacramento	CA	95825	916 920 1900
PAR	Parsec Research	Drawer 1766-P	Fremont	CA	94538	415 651 3160
PRS	P. R. Software	PO Box 169	S. San Francisco	CA	94080	415 873 6806
PTI	Precision Technology	2970 Richards St	Salt Lake City	UT	84115	801 487 6266
PUD	Public Domain 5025	S. Rangeline Rd	West Milton	OH	45383	513 698 5638
QDI	Quantum Data Inc 3001	Redhill Bld 4 #105	Costa Mesa	CA	92626	714 754 1946
QMX	Qumax - GRW Labs	PO Box 17010	Rochester	NY	14617	716 338 2145
RAC	Random Access Comptrs	PO Box 1453	Destin	FL	32541	904 837 7201
RAK	RAK Electronics	PO Box 1585	Orange Park	FL	32073	904 264 6777
RAR	RAR-Tech	PO Box 761	Rochester	MI	48063	--- --- ----
RRB	RAM/RBC Systems	PO Box 351	Malden	MA	02148	617 324 8559
RVR	RVR Systems	PO Box 265	Dewitt	NY	13214	315 446 8709
SKY	Skyles Electric Works	231-E S. Whisman Rd	Mountain View	CA	94041	415 965 1735
SLA	Slagh System Services	PO Box 53	Dearborn	MI	48121	313 846 6666
SPE	Specific Software	PO Box 10516	San Jose	CA	95157	--- --- ----
SUN	Sunrise Electronics	7057 Lompoc Court	Citrus Heights	CA	95610	916 969 8319
TAY	Taylormade Software	8053 E. Avon Ave	Lincoln	NE	68505	402 464 9051
TEL	Telegames	PO Box 152	Hampton	Ontario	L0B 1J0	416 263 8064
TIS	Total Information Serv	PO Box 921	Los Alamos	NM	87544	--- --- ----
TOR	Toronto PET Users Club	381 Lawrence Av West	Toronto	Ontario	M5M 1B9	416 782 9252
TSA	TSASA Software	2 Chipley Run	West Berlin	NJ	08091	609 346 3063
UMI	United Microware Ind	3503 Temple Ave # C	Pomona	CA	91768	714 594 1351
VCC	Vic Computing	39-41 North Road	London England	--	N7 9DP	01 607 9489
VSI	Victory Software 2027-A	S.J. Russel Cir	Elkins Park	PA	19117	215 576 5625
WUN	Wunderware	PO Box 1287	Jacksonville	OR	97530	503 899 7549

COMPUTER WAREHOUSE

CALL TOLL FREE 1-800-528-1054

ATARI

Special 32K 800 System

800 w/32K, recorder, Pac Man or Star Raiders, joysticks	**Call**
Above w/48K	**Call**

Pac-Man Special

400 w/16K, 2 joysticks, Pac-Man	**$333**

800 (16K)	**$655**
400	**$285**
810 Disk Drive	**$440**
850 Interface	**$170**
410 Recorder	**$75**
830 Modem	**$155**
16K Memory	**$60**
32K Memory	**$90**
80 Column Board	**Call**

COMMODORE

VIC-20	**$180**
Datacassette	**$60**
Single disk drive	**$320**
16K Memory	**$95**

TI 99/4A HOME COMPUTER

10" Color monitor	**$355**
Disk controller	**$220**
Disk drive	**$375**
32K Memory	**$290**
Expansion box	**$185**
Expansion box disk controller	**$185**
Expansion box disk drive	**$290**
Expansion box 32K memory	**$220**

DISK DRIVES

Lobo	
Apple 1st Drive	**$400**
Apple 2nd Drive	**$350**
Percom	
Atari D/D Drives	**Call**

MONITORS

Zenith	
12" Green Screen	**$115**
Amdek	
Video 300	**$145**
Color I	**$310**
Color II	**$650**
Color III	**Call**
BMC	**Call**
Comrex	
13" RGB Color	**$460**
NEC	
JB 1201	**$155**
JB 1260	**$115**

MODEMS

Hayes Smartmodem	**$215**
Novation	
CAT	**$140**
D-CAT	**$155**
Apple Cat II	**$349**
Auto Cat	**$235**

SOFTWARE

	CP/M	IBM		CP/M	IBM
Ashton-Tate	**Call**	**Call**	Sorcim Supercalc	**$225**	**$225**
WordStar	**Call**	**Call**	Innovative Software T.I.M.	**$425**	**$350**
MailMerge	**Call**	**Call**	CBasic	**$100**	**NA**
SpellStar	**Call**	**Call**	Microsoft Basic 80	**$265**	**NA**
Visi-Calc	**NA**	**$195**	WordStar, MailMerge, SpellStar	**$449**	**$449**
Easywriter II	**NA**	**$275**			
Spellguard	**$225**	**$225**			

PLEASE ADD $5 PER SOFTWARE ORDER FOR SHIPPING.

SPECIAL VISICALC SYSTEM

Franklin Ace 1000, Lobo 1st Drive, Zenith Green Screen Monitor, Visicalc . . . $1800

PRINTERS

Anadex	**Call**
Anacom	**Call**
C. Itoh	
F-10—Parallel	**$1375**
F-10—Serial	**$1375**
55CPS—Series	**Call**
8510 Parallel	**$425**
Comrex	
CR-1-S	**Call**
CR-1-P	**Call**
CR-1-Q	**Call**
Datasouth	
DS 180	**$1200**
Diablo	
620 RO wo/Tractors	**$1150**
630 RO wo/Tractors	**$2050**
630KSR wo/Tractors	**$2435**
Epson	
MX-80	**Call**
MX-80 F/T	**Call**
MX-100	**Call**
NEC	
PC-8023A	**$469**
3510	**$1375**
3510 Ex	**$1645**
7710	**Call**
7720	**Call**
Okidata	
Microline 80	**$305**
Microline 82-A	**$400**
Microline 83-A	**$650**
Microline 84	**Call**
PMC	
DMP-85	**$410**
Smith-Corona	
TP-1	**$650**
Tally	
1805/1802	**$1490**
1605/1602	**$1325**
MT 160	**$625**
MT 180	**Call**
Texas Instruments	
810 Basic	**Call**

VIDEO TERMINALS

Adds	
Viewpoint	**$490**
Televideo	
910	**$570**
910 Plus	**$570**
920	**$735**
925	**$730**
950	**$915**
Zenith	
Z-19	**$680**
ZT-1	**Call**

COMPUTERS

Altos	
ACS 8000-15	**$3742**
ACS 8000-2 w/CPM*	**$2650**
Series 15D	**$2125**
Series 5-5D	**$4240**
Dynabyte	**Call**
Eagle	**Call**
NEC	
8001	**$730**
8012	**$470**
8031	**$730**
Northstar	
Advantage	**Call**
Horizon II 64K QD	**$2625**
Sanyo	
MBC-1000	**$1477**
MBC-1000 w/2 Drives	**$2000**
Televideo Systems	
TS-802	**$2600**
TS-802H	**$4450**

MOUNTAIN HARDWARE

All products	**Call**

HOUSTON INSTRUMENTS

Hi-Plot	
DMP-2	**$825**
DMP-7/8	**$2025**

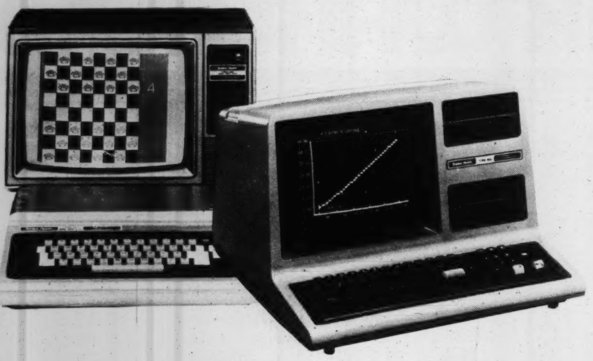
Prices reflect 3% to 5% cash discount. Product shipped in factory cartons with manufacturer's warranty. Please add $8.00 per order for shipping. Prices & availability subject to change without notice.
Send cashier's check or money order...all other checks will delay shipping two weeks.

COMPUTER WAREHOUSE

2222 E. Indian School Rd. • Phoenix, Arizona 85016
Order Line: 1-800-528-1054 Other Information: 602-954-6109

Store Hours: Mon.-Fri. 10-5 MST Saturday 9-1 MST

CIRCLE 154 ON READER SERVICE CARD



rings...trs-80 strings...trs-8

Stephen B. Gray

From the 46th floor of the TRS-80 tower, we look out on a famous games graphicist's latest undertaking, a $400 error in a recent column, two games from Liberty Software, more on blank program lines, using the PC-1 Pocket Computer as a portable data-logger, the Radio Shack/CitiLine credit card, Line Printer VIII graphics, and a short program that creates graphics from the keyboard.

Radio Shack Signs Christopherson

Leo Christopherson, one of the top computer-graphics artists in the world of personal-computer games, has taken a leave of absence from teaching to write games for Radio Shack.

Leo is famous for programs that are outstanding for their animated graphics and ingenuity, such as *Android Nim* (June 1979, p. 125), *Cubes* (Aug. 1980, p. 162), *Snake Eggs* (Aug. 1980, p. 162), *Lifetwo* (Aug. 1980, p. 162), *Dancing Demon* (Oct. 1982, p. 178), and *Voyage of the Valkyrie* (June 1982, p. 220).

Leo has been teaching mathematics and "sometimes science" to seventh and eighth graders in a junior high school in the Franklin Pierce School District outside Tacoma, Washington.

For a year, and possibly a second year, Leo will write graphics games, primarily for the Color Computer, working at home at his own pace. "They have left it pretty much up to me, as to what I'll work on," he told me. As part of his contract, Radio Shack donated 17 TRS-80 Model III computers to his school district, to be used in a network arrangement.

Radio Shack had tried in the summer of 1981 to get Leo to write full-time for them, but by then he had already signed his annual teaching contract. They asked again later, and he got a leave of absence. Both Radio Shack and the school district have agreed to a second year of full-time games programming, if Leo wants it.

Radio Shack is not the only computer manufacturer, of course, to offer Leo a job. Atari wanted him to travel around the country, giving lectures and seminars on what an Atari computer can do, but he didn't want to travel that much.

Keep your eyes open for Leo's programs under the Radio Shack label.

$400 Too Much

Somehow the game of *Talking Hangman*, described in the Sept. 1982 column (p. 208), had its price raised from $11 to $411, somewhere in the labyrinth between my printer and the phototypesetting machine. To repeat, it is $11.

Two Games from Liberty

Let's look at the first two programs marketed by Liberty Software Co. (635 Independence Ave., S.E., Washington, DC 20003), which specializes in games and educational programs. The two are games that can be played on either a Level-II Model I or Model III TRS-80 with 16K of memory: *Alien Armada* ($13.95 tape, $17.95 disk) and *Golfer's Challenge* ($13.95 tape). If you can't find these at your local computer store, Liberty can supply them, if you include $2 for shipping and handlng.

Liberty Software, by the way, is the label Acorn Software Products (also of Washington) is now using on games, because Acorn is moving "in the direction of software for more personal use, such as *Superscript* and *Instant Sort/Search Database*," one of their people told me. (Those two Acorn programs will be reviewed here in a few months.)

Alien Armada

This is a fairly standard arcade-type game, where you use the left and right arrows to move the "rocket base" left and right, and the spacebar to fire rockets at the attacking aliens, who drop bombs that can wipe you out (with accompanying sound effects) unless you move fast. If you are quick enough to wipe out the armada, along comes another, and so it continues, one alien fleet after another, as long as you live.

This is a very fast-moving real-time machine language game, for one or two players, requiring concentration and quick reflexes, even at the beginner level. Once you develop some skill, you can move to the two higher levels of difficulty, which are guaranteed to make your heart pound even if you are an expert at such games. Warning: You probably shouldn't play *Alien Armada* if you are not supposed to get excited.

DOSPLUS 4.0, the perfect score.

The DOSPLUS 4.0 hard drive system is here!

A hard drive without the dynamic new DOSPLUS 4.0 is like an eggshell without the egg. The new DOSPLUS 4.0 is the leading edge—the latest in the line of advanced disk operating systems from MICRO-SYSTEMS SOFTWARE, INC. It's the only current operating system written from the ground up for hard disk operation. Not just a driver but a fully developed system. What that means to you is more bang for your buck! Finally an unlimited TRS-80 for small business. For only $1899 you get the DOSPLUS "PLUS."

THE DOSPLUS 4.0 FEATURES

- Single volume addressing/Double sided floppies seen as one drive-one file can expand to limit of the hard drive
- Hard Disk—disk editing utilities
- Incredible I/O speed
- Runs any combination of densities or tracks
- Also operates 8" drives with special hardware—comes with expanded users guide and complete DOS technical section on I/O calls and DCB organization
- Ability to use hard drive as the "system" drive.

"PLUS" MANY OF THE SENSATIONAL NEW DOSPLUS 3.4 FEATURES

- BASIC array sort—multi key, multi array
- Tape/Disk—Disk/Tape utility (with relocator)
- Input (controlled screen input)
- Random access and ASCII modification on Diskdump
- BASIC checks for active "DO"
- Backup and Format from a "DO" file
- Much improved Backup (More reliable)

$1899

TAKE YOUR MICRO TO THE MAX. ORDER NOW!

COMPLETE WITH 5 MEG SYSTEM.

- I/O package much faster (disk access time reduced)
- Repeat last DOS command with "/" [ENTER]
- Short directory (filename and extension) available
- Short directory of Model III TRSDOS disks
- Single file convert from Model III TRSDOS
- COMPLETE device routing supported (DOS and BASIC)
- Ability to save BASIC programs directly to another machines' memory (if equipped with DOSPLUS 3.4)

NOTE: The final versions of 3.4 and 4.0 will have almost identical features and documentation.

THE COMPLETE SYSTEM

- Smooth, silent, swift
- Error-free disk I/O
- *Add on up to 4, 10 meg units for a total of 40 megabytes!
- Plugs on the 50 pin data bus.—no loss of floppy drives
- Completely self-contained—just plug it in and go

*10 meg units available Soon.

NOTE: Specify 40 or 80 track when ordering DOS diskette. After initial bootup, user can create any DOS desired.

The first in the industry backed by a lifetime warranty**

**Lifetime warranty on original media

DOSPLUS

DOSPLUS first in quality! First in the industry!

MICRO SYSTEMS SOFTWARE, INC.
4301-18 Oak Circle
Boca Raton, FL 33431
To order call toll free 1-800-327-8724
For product information (305) 983-3390

TRS-80 is a trademark of the Radio Shack Division of Tandy Corporation

CIRCLE 240 ON READER SERVICE CARD

THE BT ENTERPRISES COMPUTER CONNECTION

New Toll Free Order Number

☑ **Connection-80 BBS** State of the Art in Microcomputer Bulletin Board Programs for the TRS-80. Available for Mod I (101000) or Mod III (103000) $199.95.

☑ **Electric Pencil Ver 2.1.** This is the easiest to use word processor for the TRS-80 Models I/III. Easy to follow instruction manual, full documentation. Regularly $89.95 Holiday Special $59.95!

☑ **Alarm-80** Security Company Service Maintenance Billing Package for both the Model I & III. Menu driven basic programs, handles central station billing on monthly, quarterly, semi-annual, or annual cycles. Complete sales and aging reports. Multi field customer listing. Interactive dunning program for delinquent accounts with letter writer. (113026) $499.95.

☑ **Clear Disk Drive Cases —** Give your disk drives a modern look. Clear Plexiglass Case gives a clean look to your system. Regularly $79.95 Holiday Special $69.95!!

☑ **Power Draw** A super-easy screen display generator. Allows you to save screens in Basic, Packed String, Load file, or /CMD file. Give a professional look to your program. Regularly $39.95, Holiday Special $29.95!!

☑ **Dosplus 3.4 Operating System**

You've read all about this incredible Operating System. With all its' features only the price could improve it. Sooo... Holiday Special $79.95!!!

(101005)	Model I Single Density
(101006)	Model I Double Density
(103006)	Model III

☑ **M-Zal** The most powerful Editor Assembler ever written. Full screen editing, linking loader, full macro support and much more! Holiday special only (101007) $99.95.

☑ **Electronic Messenger** Completely automated electronic mail program for the Model III. Transmitts and receives mail automatically. From a short note to a full disk! The standard in Electronic Mail for all Computers (103013) $149.95. (Now only $59.95!!!!!)

☑ **Postman Mass Mailing System** This Mass Mailing Package is without a doubt the most powerful mailing list program ever written! Info-World gave it a 4 excellent (highest) rating! Regularly $129.95. Holiday Special $99.95

☑ **Manufacturing Inventory Control** A complete point-of-sale order entry system for TRS-80 Model I III Includes Invoice Generator, Billing Record Maintenance, Inventory Tracking, Production of finished goods from raw materials, etc... Fantastic! Regular $199.00, Holiday Special $149.00!!

☑ **Pascal-80** The Fabulous Pascal-80 Package by New Classics Software. Considered to be the best Pascal Package available for the TRS-80! Regular Price $99.95, Holiday Special (113008) $79.95!!

☑ **Micro Cash** A point-of-sale Inventory Cash Register, and Accounts Receivable System for the TRS-80 Model III. Includes Invoice Generator and Inventory Control! Regularly $199.00 Holiday Special (103030) $149.95!!

☑ **Super Utility** A Must for all serious computer users. Allows ;you to repair damaged disk directories, boot tracks, etc. A real value at $79.95, but a holiday special at $39.95!!

☑ **Uniterm** A Modular Terminal program for both the Model I & III. Full Up and down loading capabilities with a 38K buffer in a 48K mackline! 113000 $79.95.

*All Holiday Specials End 1-15-83!!!

Postmarks after that date will not be accepted at these prices!!

BT ENTERPRISES

B.T. Enterprises
10B Carlough Road
Bohemia, N.Y. 11716
516 567 8155 (voice)
516 588 5836 (modem)

Dealer Inquires Welcome
Prices Subject to change
N.Y.S. Residents Add Tax

New Toll Free Lines for out of New York State orders
800 645 1165

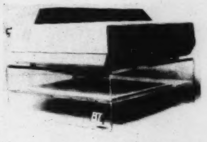
B.T. Enterprises is a division of Bi-Tech Enterprises Inc.

MasterCard VISA **WELCOME**

THE COMPUTER CONNECTION

New Toll Free Order Number

☑ Printer Stands



End the paper mess on your computer desk. Our printer stand allows your paper to be fed from under the printer, making room for the used paper to stack behind the print out of the way. Available with an optional removable shelf (Shown) for easy computer forms change. Available in Large size also, for MX-100 and other large printer users also. Also available with center slot for bottom feed printers.

Regular Stand	(300010)	$29.95
Regular w shelf	(300011)	$44.95
Large Stand	(300020)	$34.95
Large w shelf	(300021)	$49.95
Large w slot	(300050)	$49.95

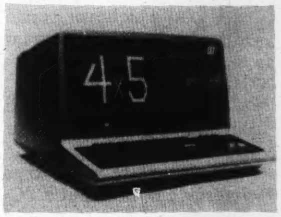
☑ B.T. Hard Disks

We want you to have all the power that your TRS-TRS-80 is capable, at prices that have other manufacturers cross-eyed! These Five, Ten and Fifteen Megabyte units are easy to use, just plug them into the expansion buss of your Model I or Model III. Comes complete with the fantastic DOS PLUS 4.0 Operating System! Available in configurations: 5 Megabyte Fixed, 10 Megabytes, 15 Megabyte Fixed. Look at the incredible low prices of our systems!

SYSTEM PRICING

5 Megabyte Winchester Fixed Disk		
201505	Model I Version	$2399.95
203505	Model III Version	2399.95
10 Megabyte Winchester Fixed Disk		
201510	Model I Version	$2549.95
203510	Model III Version	$2549.95
15 Megabyte Winchested Fixed Disk		
201520	Model I Version	$2699.95
203520	Model III Version	$2699.95

Add $10.00 shipping and handling



AVAILABLE NOW
4 Mhz
x
5 Megabytes
under
$4000

☑ Upgrade Kit

Putting Disk drives into your TRS-80 Model III will turn it into the powerful computer it was designed to be. The B.T. Enterprises DISK DRIVE INSTALLATION KIT is easy to do and represents a substantial savings over the cost if done by Radio Shack.

The kit was designed to be installed by a non-technical person, and takes an average of 45 to 75 minutes to complete. The only tools necessary are a phillips and flat head screw driver and a pair of diagonal cutters. No cutting of traces or soldering is necessary. The full instruction procedure was the topic of a feature in 80 US Magazine in the May, 1982 issue, and was given high marks for ease of installation.

KIT CONSISTS OF:

- FDC III B* Micromainframe Controller Board assembled & tested
- Switching power supply
- Disk drive mounting brackets
- All cables and hardware
- Instructions with diagrams
- Drives are optional

*FDC III C Board optional at additional cost supports 8 inch external drives and extended density 5-¼ inch drives (dual headed and 80 track)

203103	Disk Upgrade Kit B Version w/hardware	$279.95
203104	Disk Upgrade Kit C Version w/hardware	$309.95
203113	Disk Upgrade B. Version w/2 40tk & 32K	$799.95
203114	Disk Upgrade C Version w/2 40tk & 32K	$829.95
203115	Disk Upgrade C Version w/2 40tk DH & 32K	$1029.95
203118	Disk Upgrade C. Version w/2 80tk & 32K	$1029.95
203117	Disk Upgrade C Version w/2 80tk DH & 32K	$1229.95
203003	FDC III B Controller Board Only	$139.95
203004	FDC III C Controller Board only	$169.95
200500	Switching Power Supply (3 voltages)	$99.95
203010	Controller Assembly Kit	$75.00
203510	Controller Assy kit w/power Supply	$174.95

DH — Dual Headed

B.T. Enterprises
10B Carlough Road
Bohemia, N.Y. 11716
516 567 8155 (voice)
516 588 5836 (modem)

Dealer Inquires Welcome
Prices Subject to change
N.Y.S. Residents Add Tax

New Toll Free Lines for out of New York State orders
800 645 1165

MasterCard VISA **WELCOME**

B.T. Enterprises is a division of Bi-Tech Enterprises Inc.

CIRCLE 130 ON READER SERVICE CARD

Golfer's Challenge

This game of golf, for one or two players, generates 18 new holes, complete with sandtraps, waterholes, and trees, every time you play. You have a choice of 13 clubs (a driver, three woods, eight irons and a wedge) and of seven directions to aim the ball.

The holes are drawn for you, as straightaways or doglegs, one at a time, and the display shows the tee, 150-yard distance markers from the hole, various fairway hazards (T for a tree, S for sand, W for water), the green, and a number that represents the distance from tee to hole.

You select a club and direction of aim, using a table that indicates the possible yardage of each. The ball doesn't always go where you want it to, of course. When you get on or near the green, you don't putt; the computer takes over and assigns two or three shots to make the hole. After each hole, a scorecard is displayed.

Sound effects are available through earphones or the recorder AUX jack, and consist mostly of a chirping, accompanied by a flashing pixel, to show where your ball is.

The game is interesting for a round or two, but unless you are a golfer, or want to learn something about the game, or get some pleasure playing this against an opponent, you probably won't play it very long. The graphics are clever, but the ball doesn't sail through the air, and the clubs are never seen on the screen.

Blank Program Lines III

In writing about how to put blank lines between sections of your program listings, the June 1982 column (p. 217) said Radio Shack's Line Printer II ignores down-arrows, and that you must, when using the II or other printers like it, "add spaces the hard way: one at a time."

Don Davidson of Silver Creek, NJ has a marvelously simple solution:

"You had a suggestion for a better way to put blank lines in program listings using the down-arrow. It did not work, however, on a Line Printer II.

"It is almost as easily done on a Line Printer II, though. Just add a space after the down-arrow. For example, to leave two spaces, just add (down-arrow)(space) (down-arrow)(space) at the end of the line."

It works. Of course, after the (down-arrow)(space), you have to press ENTER, to get the prompt for the next line.

PC-1 as Portable Data-Logger

In the PC-2 section of the RSC-7 catalog, it says "Radio Shack will introduce an RS-232C interface and software to allow the PC-2 to function as a terminal." Well, you can get a hardware/software package right now that will let you use the earlier PC-1 Pocket Computer as a portable data-logger.

With the PTR Interface from Protean Scientific (Route 13, Lincoln, NE 68527), you can use the TRS-80 PC-1 to transfer data tapes from the Pocket Computer to a TRS-80 Model I or III. The PTR Interface connects directly to cassette recorder cables of the desktop computer, and doesn't have to be removed during normal cassette operation. An LED flashes to indicate the transfer of data. The interface operates from batteries, and thus cuts down on cable clutter.

The PTR Interface reads both alpha and numeric data, so you can either load datafiles as they occur on the tape, or search for datafiles by name. You can load complete files, or specify the number of memories you want transferred. Checksum errors identify invalid data.

Protean Scientific provides a sample Basic program which calls an assembly-language routine. The PTR package, which is $99.95 plus $2.50 for shipping and handling, includes the assembled electronic interface, a cassette tape with the assembler and Basic programs, and a detailed 15-page user manual. The software works with a Model I or III and is supplied in three versions—for 16K, 32K and 48K systems—on the same tape.

According to a letter from Protean Scientific President Robert K. Nickel, the interface "is essentially the outgrowth of a need we perceived for a low-cost data-logger for geophysical measurements. We believe that there are many possible applications in fields such as geology, archeology, botany, zoology, and agronomy. Virtually any specialized study which involves the collection of data in field or laboratory environments could realize greater efficiency and accuracy by using a pocket computer to record data." There are also, of course, many business uses for a data-logger, such as taking inventory.

Using the PTR Interface

The PTR Interface connects between a cassette player and the cassette port of a TRS-80 Model I or III. The interface modifies the data signals from a PC-1 tape to be compatible with the tape-reading circuit of the desktop TRS-80 and the PTR assembly-language program.

The software consists of two programs, the PTR assembler program which transfers data from the PC-1's data tape to the memory of the desktop computer, and a Basic demonstration program which shows how PTR is called and how the data received from PTR is converted into numeric and string Basic variables. Part or all of the Basic program can be incorporated into your Basic programs.

First you connect the PTR Interface in series with the TRS-80 cassette cable and the earphone jack of the cassette recorder. Using the SYSTEM command, you load whichever version of the PTR assembly language program is appropriate to the memory size of your Model I or III. Then load the Basic program, and make a couple of small changes in the listing, depending on the size of your memory size.

Now you are ready to go. Turn on the interface switch, put a PC-1 data tape in the cassette recorder, and RUN the Basic program. You will be asked to enter the name of the file you want to read, and how many registers you want to read from the data file. Pressing ENTER will result in all registers being read.

If you have entered TESTX as the file name, the screen will display

HENDERSON- I WANT THAT PRINT OUT ON MY DESK FIRST THING IN THE MORNING!
YES SIR!
BUT FIRST... HERE'S THE CAPTAIN OF THE DEEP SPACE PROBE, STAR HAWK II ORBITING THE ENEMY PLANET. RED ALERT! PREPARE FOR BATTLE !!

Lyco Computer Marketing & Consultants

TO ORDER
CALL US

TOLL FREE 800-233-8760
In PA 1-717-398-4079

November ATARI SPECIALS

810 Disk Drive	$429.00
32K RAM	$ 79.00
400 16K	$255.00
800 48K	**$639.00**

ATARI®
A Warner Communications Company

PERCOM : In Stock

Single Drive	CALL
Dual Drive	CALL

(Read all Atari Disks)

PRINTERS : In Stock

Epson Mx 80	$449.00
Epson Mx 80 FT III	$499.00
Okidata 82A	$479.00
Okidata 83A	$719.00
Okidata 84	$1089.00
Citoh	CALL
NEC	CALL

(Interfacing Available)

JOYSTICKS : In Stock

Atari CX-40	$18.00
LeStick	$34.00
Wico Command Control	$24.00

Computer Covers :

800	$6.99
400	$6.99
810	$6.99

DISKETTES : In Stock

Maxell MD1 . . .(10)	$34.00
Maxell MD2 . . .(10)	$44.00
Elephant . . .(10)	$21.00

THIRD PARTY SOFTWARE ATARI PROGRAM EXCHANGE

Eastern Front 1941	$25.50
Avalanche	$15.50
Outlaw/Howitzer	$15.50
Dog Daze	$15.50
Wizard of War	$31.00
Gorf	$31.00
Frogger	$26.00

BUSINESS SOFTWARE : In Stock

Atari Word Processing	$109.00
Letter Perfect	$129.00
Test Wizzard	$ 89.00
Datasam/65	$125.00
Interlisp	$125.00
Monkey Wrench	$ 42.00

ATARI HARDWARE

410 Cassette Recorder	$75.00
825 Printer	$585.00
830 Phone Modem	$149.00
850 Interface	$164.00

PACKAGES

CX481 Entertainer	$69.00
CX482 Educator	$125.00
CX483 Programmer	$49.00
CX494 Communicator	$325.00

SOFTWARE

CXL4013 ASTEROIDS	$28.75
CXL4004 BASKETBALL	$26.75
CX4105 BLACKJACK	$12.75
CXL4009 COMPUTER CHESS	$28.75
CXL4012 MISSLE COMMAND	$28.75
CXL4011 STAR RAIDERS	$35.00
CXL4006 SUPER BREAKOUT	$28.75
CXL4010 3-D TIC-TAC-TOE	$26.75
CXL4005 VIDEO EASEL	$26.00
CXL4008 SPACE INVADERS	$28.75
CX8130 CAVERNS OF MARS	$31.75
CXL4020 PAC MAN	$32.75
(NEW) CENTIPEDE	$32.75
CX4121 ENERGY CZAR	$12.75
CX4108 HANGMAN	$12.75
CX4102 KINGDOM	$12.75
CX4112 STATES & CAPITALS	$12.75
CX4114 EUROPEAN COUNTRIES	$12.75
CX4101 PROGRAMMING I	$19.95
CX4106 PROGRAMMING II	$22.75
CX4117 PROGRAMMING III	$22.75
CXL4007 MUSIC COMPOSER	$33.75
CX8102 CALCULATOR	$28.75
CX4109 GRAPH IT	$16.75
CXL4003 Assembler Editor	$45.00
CX8121 Macro Assembler	$69.00
CXL4002 Atari Basic	$45.00
CX8126 Microsoft Basic	$65.00
CXL4018 Pilot Home	$65.00
CX405 PILOT EDUCATOR	$99.00
CXL4015 TELELINK	$21.00
CX4123 SCRAM	$19.75
CX4107 Biorhythm	$13.00
CX4119 French	$45.00
CX4118 German	$45.00
CX4120 Spanish	$45.00
CX4125 Italian	$45.00

VISA

THIRD PARTY SOFTWARE
for atari 800 or 400

K-BYTE

KRAZY SHOOTOUT	$35.00
K-DOS	$65.00
K-STAR PATROL	$37.75
K-RAZY ANTICS	$37.75
K-RAZY KRITTERS	$37.75
Q-BALL JOYSTICK KIT	$6.75

AUTOMATIED SIMULATIONS

Star Warrior	$28.00
Crush, Crumble & Chomp	$23.00

WE CARRY MANY OTHER THIRD PARTY PRODUCTS YOU CAN CALL FOR PRICES ON AND ASK FOR YOUR FREE ATARI PRODUCT CATALOG.

commodore

VIC-20	**$189.00**
VIC1530 DATASSETTE	$67.00
VIC1540 DISK DRIVE	$499.00
VIC1515 PRINTER	$355.00
VIC1210 3K RAM	$35.00
VIC1110 8K RAM	$52.00
VIC1211A SUPER EXPANDER	$53.00

VIC-20 SOFTWARE

VIC1212 PROGRAMMER AID	$45,00
VIC1213 VICMON	$45.00
VIC1906 SUPER ALIEN	$23.00
VIC1914 ADVENTURE LAND ADVENTURE	$35.00
VIC1915 PRIVATE COVE ADVENTURE	$35.00
VIC1916 MISSION IMPOSSIBLE	$35.00
VIC1917 THE COUNT ADVENTURE	$35.00
VIC1919 SARGON II CHESS	$35.00

THIRD PARTY SOFTWARE

ALIEN BLITZ	$21.00
Omega Race	$35.00
Gorf	$32.00
16K RAM/ROM	$99.00
AMOK	$21.00
SUPER HANGMAN	$16.00
SPIDERS OF MARS	$45.00

POLICY

Pre-paid orders receive free shipping in the continental U.S.
Personal checks require four weeks clearance before shipping
In-Stock items shipped within 24 hours of order
Back-Ordered and Out-of-Stock items shipped as soon as they are available
Cancellation of Back-Order and Out-of-Stock items prior to shipping receive full refund or credit towards another purchase upon request.
All products subject to availability and price change.

TO ORDER
CALL TOLL FREE
800-233-8760
In PA 1-717-398-4079
or send order to
Lyco Computer
P.O. Box 5088
Jersey Shore, PA 17740

CIRCLE 225 ON READER SERVICE CARD

```
SEARCHING FOR:    TESTX

NO DATA STREAM
```

until the first file is found. If there are other files on the tape before TESTX, the display will show their names to indicate which files are being skipped and also show the contents of the data registers as they are passed; for example:

```
SEARCHING FOR:    TESTX

SKIPPING:         TESTB

+1.782010312D-02
```

When the desired data file is reached, the display changes to

```
LOADING:      TESTX
```

meanwhile also displaying an error count and register count. As soon as the file is loaded, the display changes completely, and the register contents are displayed; for example:

```
REG. 1= SCA5
REG. 2= 3423
REG. 3= 93275
```

and so on, until the contents of all selected registers are displayed. Errors are flagged and counted.

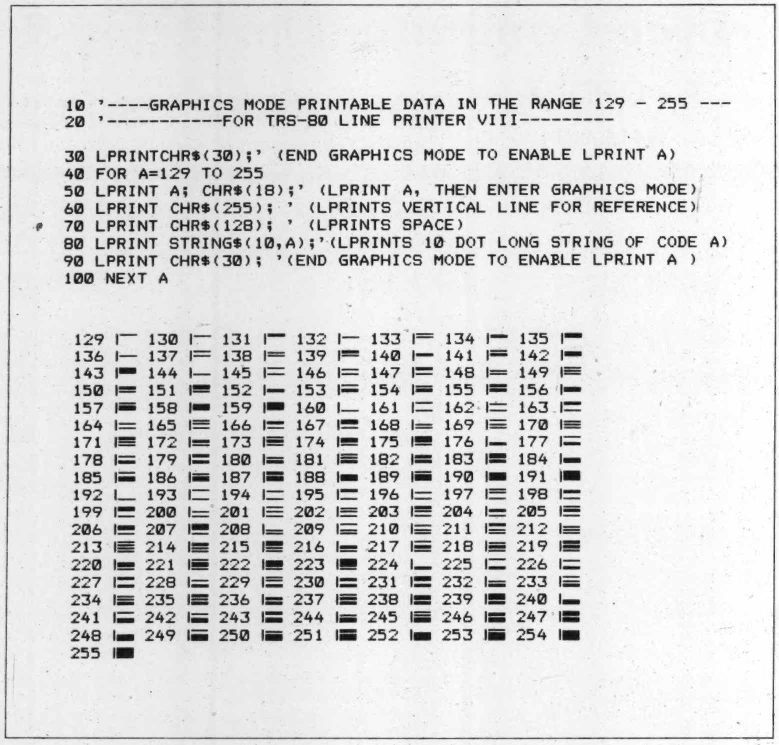
That is all there is to it; using the PTR Interface is about as simple as possible. The manual explains all operations in a very clear way, and also includes several pages on Theory of Operation, plus a listing of the Basic program, should you want to use it in one of your own programs.

Radio Shack/CitiLine Credit Card

For several months now, there has been a new credit card available "for qualified consumers who want a revolving loan account with Citibank...for big-ticket purchases from Tandy's Radio Shack stores. The card can also be used to purchase financial services," according to the press release.

EXCHANGES/REFUNDS
Dave Howell

"As a matter of fact, it worked too well—I programmed my income, budget, and expenses and it advised me I couldn't afford to own it!"



```
10 '----GRAPHICS MODE PRINTABLE DATA IN THE RANGE 129 - 255 ---
20 '-----------FOR TRS-80 LINE PRINTER VIII---------

30 LPRINTCHR$(30);' (END GRAPHICS MODE TO ENABLE LPRINT A)
40 FOR A=129 TO 255
50 LPRINT A; CHR$(18);' (LPRINT A, THEN ENTER GRAPHICS MODE)
60 LPRINT CHR$(255); ' (LPRINTS VERTICAL LINE FOR REFERENCE)
70 LPRINT CHR$(128); ' (LPRINTS SPACE)
80 LPRINT STRING$(10,A);'(LPRINTS 10 DOT LONG STRING OF CODE A)
90 LPRINT CHR$(30); '(END GRAPHICS MODE TO ENABLE LPRINT A )
100 NEXT A
```

```
129    130    131    132    133    134    135
136    137    138    139    140    141    142
143    144    145    146    147    148    149
150    151    152    153    154    155    156
157    158    159    160    161    162    163
164    165    166    167    168    169    170
171    172    173    174    175    176    177
178    179    180    181    182    183    184
185    186    187    188    189    190    191
192    193    194    195    196    197    198
199    200    201    202    203    204    205
206    207    208    209    210    211    212
213    214    215    216    217    218    219
220    221    222    223    224    225    226
227    228    229    230    231    232    233
234    235    236    237    238    239    240
241    242    243    244    245    246    247
248    249    250    251    252    253    254
255
```

The new card, called Radio Shack/CitiLine, is said to be the first such national "co-branded" bank card. It is accepted only at Radio Shack stores "in the 48 contiguous states," and is for financing a purchase of $225 or more. Borrowers pay about two percent a month; there is no annual fee.

Now you can get "instant credit" for buying a Radio Shack hi-fi or music synthesizer, or even a TRS-80 computer.

Line Printer VIII Graphics

Last month's column featured Radio Shack's dot-matrix Line Printer VIII (p. 306), which offers proportional spacing, elongated or condensed characters, underlining, superscripts, subscripts, and many more features, including 30 graphics characters.

Each of the 30 characters consists of six vertical dots in various combinations, which the printer manual says can be used "for drawing pictures, figures, or graphs." Fifteen of the characters are four small squares in all their combinations (the last of which is a larger square), eleven short lines and sets of intersecting lines that can be used to construct forms, and four triangles that face in different directions.

Bill Fronek, of Houston, TX, sent the above program and RUN to give some idea of what can be done with columns of dots, but in this case, it's all possible combinations of seven dots.

Line 50 puts the printer in graphics mode, which is a bit-image printing mode, and thus quite different from the character printing mode ordinarily used. In graphics mode, printable data must be in the range 128-255; you can print any combination of seven dots in a dot column. Each dot is controlled by one bit in the data byte, in which the high bit (value 128) is always on, so that, in effect, the printout above represents the binary numbers 1 through 127.

Line 80 prints a 10-dot-long string of columns. Note that, if you select the right dot combinations, and string them together properly, you can create almost any dot-matrix character you wish, from foreign alphabets to tiny pictures.

The catch with trying to print the 30 graphics characters referred to above is that the manual doesn't tell you how to do it. There is a table of printing codes, but these codes range between 225 and 254, which are the same codes used for bit-image printing. The Line Printer VIII manual is highly frustrating, to say the least.

Short Program #34: Keyboard Graphics

A letter from Cincinnati includes a program for the Model-I Level-II computer:

"Did you know that it is possible to place graphics on the screen from the keyboard? The following program is one method of doing it and can be used in all sorts of games.

```
5 CLS: PRINT
10 INPUT "ENTER A NUMBER
   BETWEEN 64 AND 69"; X
15 CLS: PRINT
20 B$=INKEY$
30 PRINT CHR$(ASC(B$)+X); " ";
40 GOTO 20
```

"This program gives you direct control over 58 of the graphics characters at one time, using shifted and unshifted entries (there is a total of 63 graphics characters). In this range of X, all of the letters of the alphabet give graphics as well as (sometimes) # @ = ?<>. I would appreciate knowing if someone can figure out how to control all of the characters."

If you have written a game or two using INKEY$, you may realize, without running this program, that it won't work. It was typed, and since few of us are great typists, extra care must be taken when typing up a program instead of using a printer.

RUN this program, and you get

?FC IN 30

or on a Model III,

Illegal function call in 30

which may, of course, lead you to think something is wrong with line 30. What's that pair ~~of double-quotes for~~? Nothing, apparently, so take them out. And you get the same error message.

If you assume the error is in line 30, you might pare the problem down to what may seem the heart of the problem:

20 B$=INKEY$

30 PRINT ASC(B$)

Run this and you'll get the same error message, which is somewhat mystifying because, according to the Level II manual, this pared-down version of line 30 is OK.

So, finally, you look at page 5/5 of the Model II manual (page 166 of the Model III manual), and you find, "INKEY$ returns a one-key string determined by an instantaneous keyboard strobe. If no key is pressed during a strobe, a null string (length zero) is returned....Because of the short duration of the strobe cycle (on the order of microseconds), INKEY$ is invariably placed inside some sort of loop, so that the keyboard is scanned repeatedly."

After reading the rest of the text about INKEY$, you soon realize all you need add to the Cincinnati program to make it work is a simple loop:

25 IF B$="" THEN 20 ELSE 30

Mystery: What was the original, working version of the Cincinnati program? Was the one-space string at the end of line 30 originally part of something like line 25? What do the two PRINT statements do for the program?

Enter a 64 after you RUN the program, and keys A-Z plus # and @ will give you a total of 54 graphics characters, with the graphics codes 129-156 and 160-186. That's using the SHIFT key, too.

If you enter a 69 after you RUN the program, you shift the "window" five places to the right, so to speak (so to write?), and by using keys A-Z plus = @<>? @ you obtain 59 graphics characters with codes 129-160 and 165-191. That takes care of all 63, counting the other set also.

So what the last sentence in the Cincinnati letter must mean is: Can you write a program that will generate all 63 graphics characters from the keyboard, without having to use ENTER or anything similar in line 10? The answer involves a knowledge of ASCII codes below 32, and between 91 and 95, inclusive. Assuming, of course, that there is a program that will do the trick. ☐

Announcing a new computer reference book for pilots and navigators!

Computers for Sea & Sky is an outstanding new reference volume that applies computer technology to air and sea navigation. This state-of-the-art book substitutes computer programs for reams of charts and tables, and replaces hours of hand calculation, research and interpolation with microprocessor speed and accuracy.

Computers for Sea & Sky provides the serious aircraft pilot or ocean navigator with computer programs in BASIC that perform vital computations in seven major areas:

■ **AVIATION**, covering programs for DME speed correction, turn performance, rate of climb, crosswind computation, and more.

■ **NAVIGATION**, including course correction, area navigation from a VOR, Great Circle computations, distance from a VOR/OMNI.

■ **SPEED and DISTANCE**, with programs for computing line-of-sight distance, distance to an object on the horizon, distance by vertical angle, and speed.

■ **METEOROLOGY**, covering relative humidity and dew point, temperature conversion, barometric correction and units, freezing level/flight level computations.

■ **TIME and THE SKY**, including altitude, azimuth and amplitude, time into arc, sunrise/sunset and more.

■ **CHARTS**—meridional parts, scaling, and latitude/longitude dimensions.

■ **MATHEMATICS**, including triangle, circular curves, coordinate conversion, haversine computation.

The programs in *Computers for Sea & Sky* can replace fully 1,000 or more of less accurate charts and tables, as well as onboard equipment costing thousands of dollars. The programs, generally accurate to six decimal places, can be run on virtually any microcomputer.

Take advantage of the speed and efficiency of microcomputer navigation and analysis in your plane or boat—order *Computers for Sea & Sky* today—only $9.95!

- Large 8½" by 11" size.
- Glossary, index, bibliography and appendix of constants.
- Easy-to-use BASIC programs, run and debugged on a UNIVAC 1100/82 system.
- Written by a noted computer lecturer and author who is a licensed pilot and FAA certified ground instructor.

ONLY $9.95!

Computers for
SEA&SKY

creative computing

Dept HA2H, 39 East Hanover Avenue, Morris Plains, NJ 07950

Please send me ______ copies of *Computers for Sea & Sky*, at $9.95, plus $2 postage and handling, each. (Foreign orders—except Mexico and Canada—add $3 additional per order. (Shipped air mail only.) #14F

CHECK ONE:

☐ Payment enclosed $__________. NJ residents add 5% sales tax.

Charge my:

☐ American Express
☐ MasterCard
☐ Visa

Card No.______

Expiration Date______

Signature______

Mr.
Mrs.
Ms.______
(please print full name)

Address______ Apt.______

City______

State/Zip______

☐ Check here for FREE catalog.

Please have this in hand when ordering.

Charge orders, CALL TOLL FREE 800-631-8112 (In NJ 201-540-0445)

Institutions only: Purchase orders under $50 not accepted.

AUTHORIZED
SERVICE

Now you can get **FACTORY AUTHORIZED** service for your Commodore or Atari computer and peripherals at reasonable cost. Minimize your down time frustration and expense. Extended warranty available for most products, too!

Micro Computer Service Center

CALL 717-327-1450

477 E. Third St., Williamsport, PA 17701

CIRCLE 373 ON READER SERVICE CARD

STATIC ELECTRICITY - THE INVISIBLE THIEF
A TOUCH IS ALL IT TAKES

A touch is all it takes to rob memory, alter expensive programs or produce faulty data. Levels of **2000 VOLTS** can pass **UNNOTICED** by humans and cause computer or program failure.

WATTS OUT can prevent equipment malfunction caused by static discharge. It is **MNEMONIC** and **ANTI-STATIC DEVICE** designed to eliminate body capacitance effects involved in friction generated static, especially formulated out of a conductive polyethylene with surface resistivity of 10^5 ohm/cm or less.

Please send ________ WATTS OUT (at $5.95 ea.). Make check, money order payable to Associated Research Enterprises. Colorado residents add 3.5% sales tax. Price includes shipping. Overseas orders add 15%.

Item subject to availability. Allow four to six weeks delivery in U.S. and six to eight for shipments outside U.S.

ASSOCIATED RESEARCH ENTER. P.O. BOX 22463
DENVER, CO 80224 Dealer Discounts Available.

CIRCLE 119 ON READER SERVICE CARD

iews...book r

Steve Gray, et al.

A Practical Introduction to Computer Graphics, by Ian O. Angell. John Wiley & Sons, New York. 154 pages, paperback $16.95. 1981.

This slim British book provides a quick but thorough look at computer graphics for those familiar with college-level math and Fortran. It moves fast: page two presents a simple program (and then a shorter version) for drawing a square, shows the results, then asks the reader to "draw a triangle, a pentagon and a hexagon with programs similar ,to those above."

The programs are not explained, perhaps because the additional text would add several dozen pages to the book, which is expensive enough as it is. There are dozens of Fortran programs in the ten chapters, on 2-D graphics, 2-D matrices, clipping and covering, 3-D coordinate geometry, 3-D matrices, perspective and stereoscopic views, hidden-line algorithms, setup techniques, computer movies, projects, and a conclusion. Exercises are scattered throughout the book, but no answers are provided.

On page 10, Angell gets into vector pairs, by page 26 into matrices, and by 43 into direction cosines. So you'd better have a good grounding in math, or be prepared to learn a lot. The author writes clearly, with a lean style that concentrates on the essentials. An example: "There need only be three basic forms of coordinate-system change; that is, translation of origin, change of scale, and rotation of axes; all other changes can be formulated in terms of these three types."

The book "is essentially a third-year degree course given to undergraduates at Royal Holloway College, University of London," and as with nearly all Wiley books, is very nicely produced, with clear program listings, very neat drawings, and much attention paid to typography. If you are interested in computer graphics, have a good enough background in Fortran to convert the programs to Basic or whatever language you are using, and can cope with matrix determinants, you will find this book a valuable introduction.

Excuse Me, What Was That? Confused Recollections of Things that Didn't Go Exactly Right, by Anton Braun Quist. Dilithium Press, Beaverton, OR. 1982.

My experience has led me to believe that humor books of this sort have a common tendency: a majority of them are not very amusing. This book is an exception, and a notably witty one. It is a compendium of some bizarre and ostensibly true goings on in the realm of men and machines. Dilithium Press should do itself a favor, however, and retitle the book. Something like "Technological Tangles" would probably fill the bill.

Rather than restricting itself to computer tales, the book approaches many aspects of technological *faux pas*, ranging from lens-making to flying, even driving a bus. Quist attests to the veracity of every story he presents, and Dave Ahl has confirmed the truth of at least one of the stories.

Each tale underscores the author's philosophical bent, namely, that "there's a touch of panic in all human endeavor, a drive to be mysterious that flavors all action, and has not yet been accounted for in formulas for predicting results."

Rings true, doesn't it? Otherwise stated, "you never know until later."

Take the example of the R&D group that wanted to print on strawberries. Marketing studies have shown that the word "Sunkist" sells citrus fruits. If only, the innovators mused, they could do the same for the strawberry. A promising electrostatic process was developed, similar to Xeroxing, wherein ink powder could be accurately put on nearly anything. "Indeed, Time Magazine ran a picture of a label that had been put on a raw egg on a plate. (No, not on the shell, on the raw yolk and white lying right there on the plate.) 'We can print on still water,' said the proud innovators who had developed the basic technology."

The only problem was they had no way to *affix* the powder to the medium. A Xerox machine uses heat to fuse the powder. Certainly this couldn't be done to a strawberry. The developers dabbled with all sorts of fixes, but they couldn't get the powder to stay. No matter what. Case closed.

Then there was the outfit that turned out the traveling wave tubes, very crucial to radar technology. One day they simply lost the ability to turn out working tubes, and understandably, began to panic. An extensive evaluation was made of assembly line practices. Rigid standards were enforced. Still, no tubes would work.

Finally it was determined that production stopped just when a female employee left the company. They feverishly brought her back. She began creating working tubes.

It seems she used her thumbnail as a guide when inserting elements into the tube. "They used a micrometer on her thumbnail, prepared a gauge of the same thickness, and used it to make traveling wave tubes that worked. So much for science."

How about the secret ingredient used to make electric eyes? Government officials couldn't make them work without it. The solution finally came out, for bladder or worse.

I'm a sucker for stories like this, and the book is chock full of them. There is something recognizable in the dirigible tester who can't seem to get hydrogen to burn until he blows himself up, or the computer that works phenomenally until the moment it's on TV. Truth is that superstition still lives, and those closest to technology know this best. For some great stories documenting the "dark side of the force," this book is great.—JJA

Fun With Microcomputers and Basic, by Donald D. Spencer. Reston Publishing Co., a Prentice-Hall Co., Reston, VA. 128 pages, paperback $9.95. 1981.

This "new version" of *Fun With Computers and Basic*, originally published in 1977, is described by Reston as "an excellent book for children." But not much younger than teenage; the vocabulary is fairly sophisticated.

After introductory chapters on the Importance of Computers, How to Recognize a Computer, Telling the Computer What to Do, and Let's Talk in Basic, the book gets down to its major theme with a 70-page chapter on Problems and Programs. A nine-page glossary ends the book.

The change in title reflects the note in the preface that the programs in the current book were developed using TRS-80

APPLE HARDWARE
201 838-9027
NEW

THE TACKLER™
DUAL • MODE PARALLEL INTERFACE FOR THE APPLE®
2 BOARDS IN ONE FOR NO MORE COMPATIBILITY PROBLEMS!

An intelligent board to provide easy control of your printer's full potential. Plus a standard parallel board at the flip of a switch -- your assurance of compatibility with essentially all software for the APPLE®. Hires printing with simple keyboard commands that replace hard to use software routines. No disks to load. Special features include inverse, doubled, and rotated graphics and many text control features, available through easy keyboard or software commands.
It's simple to print HIRES graphics from an APPLE computer with The Tackler from TYMAC. This is the first truly universal parallel interface! Plus the ROM for your specific printer. Sophisticated intelligence when you need it, total compability that never lets you down.
Change printers -- no need to buy another board. Just plug in one of our ROM'S and you're all set. ROM'S available for Epson, C. Itoh, NEC, and Okidata -- others available soon.
You've asked us to make the TACKLER better than the others and we did. $159.00 *

UPGRADEABLE PARALLEL PRINTER CARD
A Universal Centronics type parallel printer board complete with cable and connector. This unique board allows you to turn on and off the high bit so that you can access additional features in many printers. Easily upgradeable to a fully intelligent printer board with graphics and text dumps. Use with EPSON, C. ITOH, ANADEX, STAR-WRITER, NEC, OKI and others with standard Centronics configuration. **$139.00**

THE PERFORMER PRINTER FORMATTER BOARD for Epson, OKI, NEC 8023, CITOH 8510 provides resident HIRES screen dump and print formatting in firmware. Plugs into Apple slot and easy access to all printer fonts through menu with PR# command. Use with standard printer cards to add intelligence. **$49.00** specify printer.

THE MIRROR FIRMWARE FOR NOVATION APPLE CAT II®
The Data Communication Handler ROM Emulates syntax of an other popular Apple Modem product with improvements. Plugs directly on Apple CAT II Board. Supports Videx and Smarterm 80 column cards, touch tone and rotary dial, remote terminal, voice toggle, easy printer access and much more.
List $39.00 Introductory Price **$29.00**

DOUBLE DOS Plus
A piggy-back board that plugs into the disk-controller card so that you can switch select between DOS 3.2 and DOS 3.3. DOUBLE DOS Plus requires APPLE DOS ROMS. **$39.00**

Super PIX SOFTWARE
The Software package that will allow your printer to dump page 1 or page 2 of the Apple Hires screen horizontally or vertically. Use with EPSON® MX-80 with or without GRAFTRAX® Roms, MX-70 – OKI® Microline 80, 82, 83, 82A, 83A – C. ITOH® 8510 and NEC 8023A. Requires Tymac Parallel Printer Board PPC-100 . . . **$24.95.**

APPLE LINK – A versitile modem utility that provides the Apple user the ability to transfer disk files and software over the phone. Only one package needed for full transfers. Compatable with all DOS file types. **$59.00**
(requires Hayes Micro Modem)

THE APPLE CARD – Two sided 100% plastic reference card Loaded with information of interest to all Apple owners. **$3.98**

NEW FOR THE VIC 20®

WORD WIZARD
A user friendly **WORD PROCESSOR** with full joystick control (use of joystick optional). Easy edit and string manipulation commands that follow the standard VIC 20* format. Full use of function keys for ease of use. Only **$34.95***
*Requires at least 8K RAM cartridge.

*Call or write us for information on our other EXCITING ITEMS FOR THE VIC**

VISA MasterCard
MICRO-WARE DIST. INC.
P.O. BOX 113 POMPTON PLAINS, N.J. 07444
Dealer and Distributor Inquires Invited.

CIRCLE 241 ON READER SERVICE CARD

and Apple computers, and will run on many others.

Almost fifty programs are included in the long chapter, starting with simple ones such as metric conversion and grade average, and working up to complex programs such as Magic Square and Buried Treasure. Many interesting programs are provided, such as Armstrong numbers, perfect numbers, coin-tossing, and slot machine.

Every few programs, the author asks the reader to write one or more on his own, building up to more and more complicated ones, such as Wheel of Fortune.

Written with Spencer's usual straightforward style, and enlivened with dozens of drawings and cartoons, this book is very good for a beginner of almost any age, from the teens on up, who's interested in learning how to program by first copying a few programs from the book, seeing how they run, and then writing a couple on his own. No solutions are provided in the back of the book.

Introduction to Interactive Computer Graphics, by Joan E. Scott. John Wiley & Sons, New York, NY. 265 pages, hardcover $24.95. 1982.

Although the preface says "this book combines in a single volume both technical information about graphics systems and practical knowledge concerning their use," the emphasis is almost entirely on "what" and not "how." There are no programs, no program lines, and very few equations.

However, there is much of interest here for those who want a good but quick look at what can be done with computer graphics. There are hardware chapters on Input Devices at the Work Station (light pens, digitizers, joysticks, trackballs, dials, keyboards, buttons, switches, voice data-entry), Interactive Display Devices, Lasting Results (plots, hard copy, photographs), Graphics Suppport; software chapters on Building the Computer Model, Interactive Input Techniques, Viewing the Computer Model, 3-D Viewing, Application Programs; and two final chapters, on Management Concerns, and Application Survey.

Most of the hardware chapters, and one of the software chapters, provide a vendor list for the products described, and there is a 38-item list of references for those wishing to delve further into various topics, although only one is dated after 1978, and that is Newman and Sproull's 1979 *Principles of Interactive Computer Graphics* (reviewed March 1980, p. 184), a better and more extensive book (from McGraw-Hill), with more than twice as many pages for the same price, although with math you would have to have a graduate degree to understand. There is a little advanced math in Scott's book, but almost entirely in the chapters on Viewing the Computer Model, and 3-D Viewing.

Scott's book is good, as far as it goes, with a good coverage of the subject, although with many extraneous words and too-long sentences. Newman and Sproull's book is hard to beat; Scott's is something like a subset of it.

The TRS-80 Means Business, by Ted G. Lewis. John Wiley & Sons Inc., New York. 203 pages, paperback $12.95. 1982.

One of the latest in Wiley's paperback guides to microcomputers, this one claims to be "the first introduction to computing with the best-selling TRS-80 Model II microcom-

TCS Heart of TEXAS COMPUTER SYSTEMS
LEADER in MAIL ORDER DISCOUNTS!
800 433-5184
Texas 817/274-5625

IBM Personal Computer
HARD DISKS 5-10-20 meg from $1588
INTERNAL DISK DRIVE from $199
EXTERNAL DISK DRIVE from $249
COLOR MONITOR from $298
QUADBOARD 64-256k/ser-par/cal-clock
PRINTERS / CABLES / SOFTWARE
MEMORY EXPANSION

ATARI
ATARI 800 COMPUTER
ATARI 810 DISK DRIVES
Percom Double Density EXT. DRIVES
ATARI 850 Interface and Cable
Compatible PRINTERS and Cables

APPLE
DISK DRIVES with DOS 3.3 & Controller
EXTERNAL DISK DRIVES
Compatible PRINTERS
INTERFACE & CABLE for most printers

TANDON DRIVES
BARE DRIVES ONLY

40 track single sided	$199
80 track (dual sided 40 track)	$269
160 track (dual sided 80 track)	$389
8 inch Slimline sgl/dbl sided	$CALL
Winchester hard drives 5-30 meg	$CALL

1 DRIVE / Single Cabinet

40 track single sided	$249
80 track (dual sided 40 track)	$329
160 track (dual sided 80 track)	$449

1 DRIVE / Double Cabinet

40 track single sided	$289
80 track (dual sided 40 track)	$369
160 track (dual sided 80 track)	$499

2 DRIVES / Double Cabinet

40 track single sided	$489
80 track (dual sided 40 track)	$639
160 track (dual sided 80 track)	$849

Drives in cabinets come assembled/tested with power supply. Order cable separately.

PRINTERS
● EPSON MX80 . MX80FT . MX100FT ● OKIDATA 82A . 83A . 84
● C.ITOH 8510 . F-10 ● CENTRONICS ● NEC Spinwriters
● RADIO SHACK LP V . VI . VII . VIII . DAISY WHEEL II
TCS has the LOWEST PRICES on IN STOCK PRINTERS!

TRS-80
TCS MODEL III 48k 2 DISK
Systems come with 180 day TCS limited warranty.
$1695 With 2 standard 40 track double density drives. Over 340,000 bytes. Includes DOSPLUS 3.3.
$1995 With 2 dual head 40 track double density drives. Over 730,000 bytes. Includes DOSPLUS 3.4.

MODEL III DISK EXPANSION KITS

1	Controller, Power Supply, Mounting Hardware & Instructions	$279
2	Controller, Power Supply, Hardware & one 40 track Tandon drive	$478
3	Controller, Power Supply, Hardware, two 40 track Tandon drives	$677
3A	Kit 3 but with two 80 track Tandon drives (dual sided 40s)	$879
3B	Kit 3 but with two 160 track Tandon drives (dual sided 80s)	$1099

16k of high quality memory chips ... $16 32k of high quality memory chips ... $32

MODEL III SYSTEMS
Original 90 day manufacturer's warranty.

MODEL III 4k Level 1	$599
MODEL III 16k	$818
MODEL III 32k	$868
MODEL III 48k	$918
MODEL III 48k 2Dr/RS232	$1944

TCS MODEL III Systems have quality TCS memory and 180 day limited warranty.

TCS MODEL III 16k	$799
TCS MODEL III 32k	$818
TCS MODEL III 48k	$848

COLOR COMPUTER
Original 90 day manufacturer's warranty.

16k Level 1	$306
32k Extended Basic	$398
32k Extended Basic	$CALL
Color Disk 0 $479	Disk 1 $349

TCS COLOR COMPUTERS use original RS hardware & TCS memory.
180 day warranty.

TCS 32k Extended Basic	$499
TCS 32k Memory Upgrade	$79
TCS Color Disk Drive 0	$449
TCS Color Disk Drive 1/2/3	$249

Model II . . Model 16 . . Accessories . . $CALL
TCS is an authorized TRS-80 dealer F701 in Brady, Texas

For fast, efficient service. Heart of we can air freight from Dallas
TEXAS COMPUTER SYSTEMS
P.O. Box 1327 Arlington, Texas 76004-1327
★ 800 433-5184
No tax out of state. Texans add 5%. Prices subject to change at any time.
DEALER INQUIRIES INVITED

CIRCLE 353 ON READER SERVICE CARD

puter that's geared specifically for business users," according to the back cover.

Chapter 1 asks Who Needs a Small Computer?, and discusses several examples in detail. Chapter 2, Computer People Talk Funny, looks at hardware and software. Chapter 3, Who Can Afford a Computer?, examines system costs. The next three chapters present programs, in The Computer as Filing Cabinet (file structures), Instant Retrieval Techniques (hashing), and The Little Databaser. Chapter 7, Analysis of Small-Business Systems, "ties together many of the concepts and techniques developed throughout the previous chapters," in looking at systems for dentist's billing, shoe-store accounts payable, stockbroker's files, etc. An admirable 22-page appendix on Getting Started With Model II Basic provides a cookbook, from turning on the power switch to editing to Basic statements to data types.

The author's teaching experience (in Computer Science at Oregon State University) is evident in his carefully detailed presentation of complex principles in an easily understood fashion. The book, however, is best understood by a fairly bright reader, especially the chapter on hashing, which may be a problem to those who didn't do well in high school or college algebra. For those who did, this book is highly recommended.

An 8" disk of all the programs in the book is available from the publisher for $19.95.

More TRS-80 Basic, by Don Inman, Ramon Zamora and Bob Albrecht, John Wiley & Sons Inc., New York. 285 pages, paperback $9.95. 1981.

One of the latest in the Wiley STG (Self-Teaching Guide) series, this sequel to the authors' *TRS-80 Basic* book "helps you build on your fundamental knowledge of Level II Basic with scores of practical applications that are both recreational and educational. It explains all TRS-80 Level II Basic statements, commands, and features not covered in their previous best seller," according to the back cover.

The book explores PEEK and POKE, several different ways of displaying graphics (including "super-graphics" techniques), and file-handling using both cassette and disk files.

The chapters include an Introduction, Guided Tour of Memory (RAM, ROM, PEEK, POKE), Graphics and Supergraphics (SET, RESET, POKE, STRINGS$), Introduction to Cassette Data Files, More about Cassette Files, Disk Operation, Using Disk Files, Tuning Up Your Computer (adding sound to programs), Special Features and Fancy Functions (saving memory, error-handling, etc.), Graphics and Animation, Arithmetic Functions, and A TRS-80 Art Lesson. Three appendixes provide a table of graphics characters, information on the cassette recorder, and error codes and messages.

Written with the well-known expertise of these veteran authors, the book explains everything in detail, with many programs and drawings. Like its predecessor, this book is also available from Radio Shack, at the same price, with a different cover (showing the Model III) and title, "Advanced Level II Basic."

These two books are what Radio Shack should have provided with the Level II TRS-80 instead of that reference manual. ☐

VIC20 PERSONAL COMPUTER

ARCADE GAME
CHRISTMAS
SALE!!

10 Most Popular Tape Programs
(for VIC-20)

Rank	Name	List	Sale
1.	Super Paratrooper (Fantastic)	$24.95	$19.95
2.	Exterminator-Plus (Better than Centipede)	$24.95	$19.95
3.	Cricket (Better than Frogger)	$24.95	$19.95
4.	3-D Hackman (3-Dimensional)	$24.95	$19.95
5.	Snackman (Better than Packman)	$19.95	$15.95
6.	Bug Blast (Creepy)	$19.95	$16.95
7.	Anti Matter Splatter (Nuclear Disaster)	$24.95	$19.95
8.	Bombs Away (Great)	$18.95	$15.95
9.	3-D Maze-Escape	$16.95	$14.95
10.	Krazy Kong	$16.95	$14.95

BUY ANY FOUR — DEDUCT 10% MORE

10 DAY FREE TRIAL!

2-4 Day Delivery-First Class Mail.
1 Day Delivery - Express Mail.

We Have Over 500 Programs.

ASK FOR FREE CATALOG!

WE LOVE OUR CUSTOMERS
(our prices prove it)

PROTECTO
ENTERPRIZES (FACTORY DIRECT)
BOX 550, BARRINGTON, ILLINOIS 60010
Phone 312/382-5244 to order

CIRCLE 285 ON READER SERVICE CARD

NEW from *Creative Computing*—

Three great books for Apple, Atari and TRS-80 owners!

Creative Computing has just produced the books you've been waiting for—the most informative, challenging and stimulating volumes yet written for the Apple,® Atari,® or TRS-80® owner!

THE creative APPLE
Edited by Mark Pelczarski and Joe Tate
THE creative ATARI
THE creative TRS-80

THE CREATIVE APPLE brings you 450 pages of the best articles and features on the Apple to appear in the past four years of *Creative Computing.* Revised and updated, this wealth of material gives you dozens of ways to tap the tremendous potential of your Apple, with information-packed chapters on:

- Graphics • Music • Education • Word Processing • Business • Applecart • Software Reviews • Programs—Ready to Run • Tips for Easier Programming • Branches

Whether you use your Apple for business, teaching, home budgeting or just having fun, you'll find plenty of ways here to get more out of it than you ever dreamed!

THE CREATIVE APPLE, edited by Mark Pelczarski and Joe Tate. 8½" x 11", softcover, illustrated, 450 pp. **$15.95.**

THE CREATIVE ATARI is an invaluable guide for the average, non-expert user who knows a little about BASIC and simple programming. The Atari is one of the most sophisticated consumer graphics devices ever invented. Yet, because it *is* so powerful, learning how to use its special features can be difficult for all but the most skilled programmers. Here's where THE CREATIVE ATARI can help. Taking articles, columns and tutorials that previously appeared in *Creative Computing,* the authors have updated the material for maximum learning ease. THE CREATIVE ATARI contains four main sections:

- An introduction, with a discussion of Atari memory concepts essential to programming.
- A tutorial on Atari graphics.
- A collection of programming tips, plus information on non-graphics areas.
- Programs you can type in yourself, with reviews of other good commercial programs available for the Atari.

You'll also find an Appendix with a reference guide to useful Atari information. Whether you're a long-time Atari owner or are just thinking about getting one, this is *the* book to have!

THE CREATIVE ATARI, edited by David Small, Sandy Small and George Blank. 8½" x 11", softcover, illustrated, 250 pp. **$15.95.**

THE CREATIVE TRS-80 is a complete guide based on articles that appeared in *Creative Computing,* covering everything from games to business applications for the TRS-80. Chapters include:

- Games, with nine full-length listings you can type directly into your computer.
- Personal productivity, with discussions on expense management, record keeping and other packages.
- Education, detailing uses for pre-school, elementary and high school students.
- Business, and making the most of your investment opportunities.
- Word processing, covering Scripsit, LazyWriter and more.
- Programming tips, suggestions on structured programming, debugging, error trapping and numerical techniques.
- Graphics, with advice from experts on how to enhance your programming capabilities.
- TRS-80 Strings—reprints of this monthly *Creative Computing* column.
- Software, an overview of commercial software ranging from chess to improving your computer's language capabilities.
- Hardware, including discussions on new models, printers and other peripherals.

Your TRS-80 is a wonderful tool for learning, having fun, and improving the quality of your life. With THE CREATIVE TRS-80, you'll expand the uses of your machine—and its value to you—in a hundred new and exciting ways!

THE CREATIVE TRS-80, edited by Ken Mazur. 8½" x 11", softcover, illustrated, 250 pp. **$15.95.**

Registered Trademarks: Apple: Apple Computer Inc.; Atari: Atari Inc.: TRS-80: Radio Shack Division of Tandy Corp.

USE COUPON OR TOLL-FREE NUMBER TO ORDER TODAY!

creative computing Dept HA2F 39 East Hanover Avenue
Morris Plains, NJ 07950

CREATIVE APPLE: Send me ______ copies at $15.95 each* plus $2 postage and handling. #18R

CREATIVE ATARI: send me ______ copies at $15.95 each* plus $2 postage and handling. #18B

CREATIVE TRS-80: Send me ______ copies at $15.95 each* plus $2 postage and handling. #18Y

*NJ residents add 5% sales tax. All foreign orders (except Canada and Mexico) add $3 to regular postage and handling charge. Shipped airmail only.

CHECK ONE:
☐ **PAYMENT ENCLOSED $**__________.
☐ **CHARGE MY:** ☐ American Express ☐ MasterCard ☐ Visa

Card No.____________________ Exp. Date__________
Signature______________________________
Mr./Mrs./Ms.______________________________
(please print full name)
Address____________________________ Apt.______
City______________ State__________ Zip__________

INSTITUTIONS ONLY: Purchase orders under $50 not accepted.

For faster service, **PHONE TOLL FREE: 800-631-8112.**
(In NJ call 201-540-0445.)

the creative computer mart

SOFTWARE AND HARDWARE SHOPPERS GUIDE

Please Direct Inquiries to: Jim Beloff; (212) 725-4216.

LEARN

Having trouble learning to use your computer?

Reference manuals don't teach. Most BASIC texts don't cover specific personal computers.

TIS solves these problems with step-by-step books tailored for your machine.

For PET/CBM

Understanding Your PET/CBM $16.95
Vol 1: Basic Programming
PET Graphics .... $ 6.95

For OSI C1P/C4P

Understanding Your C1P/C4P .... $ 9.95
A Workbook of BASIC Exercises

For VIC

Understanding Your VIC $13.95
Vol. 1: Basic Programming

Money Back Guarantee. VISA/MC accepted.
All prices include UPS or 1st Class postage.

Dealer inquiries invited

TIS INC
Total Information Services, Inc.
Box 921, Dept. CC
Los Alamos, NM 87544

PRICE BREAK

EPSON MX-80 CARTRIDGE RIBBONS

$9.95 EA.

$107.46 per dozen
Minimum Order 3 Ribbons
Price Includes Shipping
We accept Mastercard and Visa

CHECK-MATE™
P.O. BOX 103, RANDOLPH, MA 02368
Call Toll Free - 1-800-343-7706
In Massachusetts - 617-963-7694

PREMIUM DATA CASSETTES
* Manufacturers Wholesale Prices *

LENGTH	1 CASSETTE	100-PACK	500-PACK
C-10	.59	.54 ea.	.45 ea.
C-20	.66	.61	.53
C-60	.89	.83	.79
C-90	$1.29	$1.21	$1.14

SOFTWARE PUBLISHERS—Let Acts Audio provide you with all your cassette production requirements.

CUSTOM SOFTWARE DUPLICATION—For Sinclair, TRS-80, Apple, Atari —— Guaranteed to load.

Acts Audio also sells High-Speed duplication equipment modified for software duplication.

ACTS AUDIO, INC.
70 West Illiana Ave,
Orlando, FL. 32806
(305) 423-0338

VERSACALC!
VERSACALC!
VERSACALC!
VERSACALC!
VERSACALC!
VERSACALC!
VERSACALC!
VERSACALC!
VERSACALC! T.M.

TUTORIAL
UTILITIES
AND FILE MANAGER
ENHANCEMENTS TO VISICALC®

- **SORT** any number of rows: labels, values, formulas. You select the extent of the sort.
- **CONDITIONAL TESTING** to several levels
- **PRINT OUT THE LIST OF COMMANDS**
- **AUTO BATCH UPDATE** e.g. running year-to-date forms.
- **MENU—DRIVEN MODULES** for your own application programs.
- **AUTO-CATALOG** from within Visicalc
- **AUTO SCREEN FORMAT** saves hundreds of keystrokes

YES! We said, "SORT VISICALC!"

VERSACALC runs within Visicalc.

Versacalc is a trademark of Versacalc Enterprises
Visicalc is a trademark of Visicorp Inc
Apple, Apple II, Applesoft are trademarks of Apple Computers, Inc

Apple	100.00
Commodore	125.00
IBM Personal Computer	150.00
Apple ///	150.00

Dealer Demo Disk Available

Anthro-Digital, Inc.
103 Bartlett Avenue
Pittsfield, MA 01201
413-448-8278

New! FROM Aplogica New!

IBM* Personal Computer

LASER — ZAP

A new sound/graphics game!

Laser zap the aliens as they sweep across the void towards you! Requires 64k & disk BASICa.

$29.95
VISA OR MASTERCARD

Call toll free now
1-800-547-5995

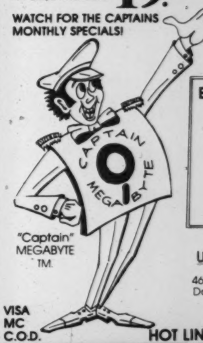
* TRADEMARK OF INTERNATIONAL BUSINESS MACH. CORP.

BRAND NAME DISKETTES

WITH HUB RINGS AND WRITE PROTECT
GUARANTEED **100%** ERROR FREE

5¼ SS/SD **19.95** (add $2.00 per box for less than 100)
All Sizes Available

WATCH FOR THE CAPTAINS MONTHLY SPECIALS!



"Captain" MEGABYTE TM.

EPSON MX 80 RIBBONS
$6.00 ea.
Min 3.
SAVE 50 %
ON MOST PRINTER RIBBONS

WESTWORLD
4699 S.W. 45th Street
Davie, Florida 33314
(305) 587-1130

VISA
MC
C.O.D.

HOT LINE 800-327-1013

SYNCHRO-SETTE

The Subscription Magazine for the Sinclair ZX-81/TS-1000 Microcomputers

Games, Educational, Business, Graphics Tutorial, Etc.

12 Mo. Issues — 6 Bi-Month
CASSETTES
AT LEAST 6 PROGRAMS EACH

$39.50

Ill. Residents add $2.07 tax
outside USA add $10.00

Ask for operator # 383
24 Hr. Hot Line 800-543-1300

THE S & S COMPANY
388 W. Lake Street
Addison, IL 60101
(312) 628-8955

HAYES MICRO MODEM II FOR THE APPLE II
$259.* PLUS SHIPPING

VIDEX 80 COLUMN CARD
$237.* PLUS SHIPPING

THE COMPUTER CENTRE
49 NORTH CENTRE STREET
CUMBERLAND, MARYLAND 21502
301-777-1000

CHECKS, MONEY ORDER, VISA, MASTERCARD ACCEPTED

CALL US FOR OUR COMPLETE HARDWARE AND SOFTWARE CATALOG!

*PROMOTION RUNNING FOR A LIMITED TIME ONLY

LABELS

2.99 perM

15/16"x3½"
1 up - pin feed

white pressure sensitive

PRICE INCLUDES SHIPPING
Packed 5M per box - Min. order 1 box -$14.95
Check with order - Mass Residents add 5% Sales Tax

CHECK-MATE™
P.O. Box 103, Randolph, MA 02368
Telephone: 617-963-7694
CALL TOLL FREE 1-800-343-7706

FREE

business software directory

- Radio Shack's Model I, II, III
- Heath's HDOS
- CPM: Xerox, Alto...
- IBM PC

Data base manager, integrated accounting package, inventory, word processing, and advanced mailing list.

Micro Architect Inc.
96 Dothan St.
Arlington, MA 02174

"DISC DOUBLER PROGRAM"

"DOUBLE THE STORAGE CAPACITY ON YOUR SS/SD OR SS/DD 5¼ INCH DISKETTES."

NOW YOU CAN INCREASE THE SIZE OF USEABLE SPACE ON YOUR SS/SD OR SS/DD 5¼ INCH DISKETTES.

ALL YOU PAY IS A ONE TIME FEE OF $12.95. USE THIS PROGRAM OVER AND OVER, AS OFTEN AS YOU LIKE, NO EXTRA FEES. THIS PROGRAM WILL WORK WITH ALMOST ALL SS/SD OR SS/DD DISKETTES. HURRY, SEND $12.95 U.S., CASH, CHECK, OR MONEY ORDER. VISA AND MASTERCARD BUYERS TELEPHONE TOLL FREE.

DISK DOUBLER PROGRAM
CP-M COMPANY
P.O. Box 1045 DEPT. CCO
WOODLAND HILLS, CALIFORNIA 91365
Nationwide 800-428-7825 Ext. 43
CA. Residents Only 800-428-7824 Ext. 43

California residents add 6% sales tax, Los Angeles residents add 6.5% sales tax. Please include $1 postage and handling. All orders shipped within 10 days. Disk doubler program copyright 1982 by computer peripheral-material company.

ATARI* SOFTWARE ADVENTURES AND GAMES

Each adventure takes up to an hour and is programmed with random variables to change the game every time you play.

THE TALISMAN OF POWER

A search through many obstacles for the four keys of Gremlock. Will you get out alive? 16K - $18.95.

THE GHOST TOWER

Find a Magical Gem in a tower haunted with Orcs, goblins, etc. 16K - $16.95.

SUPER SHAPE BUILDER

A graphics game mainly for children from age five. 'Draw' your own pictures with your joystick, in color. 8K - $9.95.

Send Check or C.O.D. - Discs $4.00 extra. *SATISFACTION GUARANTEED*. Write for further information on our GALAXIAN ADVENTURE and other software. Dealer Inquiries welcome. Continental Adventures, 4975 Brookdale, Bloomfield Hills, MI 48013. (313) 645-2140.

* Indicates Trademark of Atari, Inc.

DISCOUNT PRICES FOR APPLE II PRODUCTS

Rana 40 Track Drive	$349.00
Videx 80 Column Video Term	$235.00
Videx Enhancer II	$105.00
Videx Function Strips	$ 65.00
Mountain Computer CPS	$177.00
Mountain Computer 32K	$163.00
Prometheus 16K	$ 79.00
Laser Lower Case Plus	$ 45.00
Laser Keyboard Plus	$ 70.00

NEW ENGLAND FRUGALITY AT ITS FINEST.
Yankee Micro, P.O. Box 601, Milford, NH 03055.

ELIZA IS HERE!

AT LAST! A FULL IMPLEMENTATION of the original ELIZA program is now available to run on your microcomputer!

Created at MIT in 1966, ELIZA has become the world's most celebrated artificial intelligence demonstration program. ELIZA is a non-directive psychotherapist who analyzes each statement as you type it in and then responds with her own comment or question — and her remarks are often startlingly appropriate!

Designed to run on a large mainframe, ELIZA has hitherto been unavailable to personal computer users except in greatly stripped down versions lacking the sophistication which made the original program so fascinating.

Now, our new microcomputer version possessing the **FULL** power and range of expression of the original is being offered at the introductory price of only $25. And if you want to find out how she does it (or teach her to do more) we will include the complete **Source Program** for only $20 additional.

Order your copy of ELIZA today and you'll never again wonder how to respond when you hear someone say "Okay, let's see what this computer of yours can actually do!"

ELIZA IS AVAILABLE IN THE FOLLOWING DISK FORMATS:

1. Standard 8 inch single density for all CP/M based computers
   $25 for ELIZA COM - add $20 for Microsoft BASIC-80 Source
2. 5¼ inch CP/M for Apple II equipped with Z-80 SoftCard
   $25 for ELIZA COM - add $20 for Microsoft BASIC-80 Source
3. 5¼ inch for 48K Apple II with Applesoft ROM and DOS 3.3
   $25 for Protected File — add $20 for Applesoft Source
4. 5¼ inch for 64K IBM Personal Computer
   $25 for Protected File — add $20 for BASIC Source

ARTIFICIAL INTELLIGENCE RESEARCH GROUP
921 NORTH LA JOLLA AVENUE, Dept. R
LOS ANGELES, CALIFORNIA 90046
(213) 656-7368 (213) 654-2214
MC, VISA and CHECKS ACCEPTED

PAPER

FANFOLD BOND PAPER 9½x11
Perforated both sides, snaps out to 8½x11
Two Choices for the Same Price: **23.95**
15 lb. stock, 3200 sheets, 1-part
20 lb. stock, 2500 sheets, 1-part

SPECIAL WHITE BOND **75.95**
Blank, 1-part, 9½x11, 2200 sheets
Letterhead quality paper (20 lb.-25% cotton)
Special strip-offs produce smooth 8½x11 sheet
Selling elsewhere for $60 per 1000 sheets

HALF-INCH GREENBAR
15 lb. stock, not perforated on sides
8½x11, 3200 sheets, 1-part **23.95**
14⅞x11, 3200 sheets, 1-part **35.95**

Send check with order. Add $6.00 per box for handling and shipping (UPS) within continental US. Calif. residents add 6½% sales tax. Satisfaction guaranteed.

Call or write for free catalog and samples.

BOB'S CHARTS
Computer Paper Dept.
405 E. THIRD, SUITE 206F
LONG BEACH, CA 90802
(213) 435-3492

☆☆ SUPER™ ☆☆ ISA's DATABASE

The only DBMS with all these features:

★ PROVEN in one year of test marketing
★ TOUGH, reliable file structure
★ MENU driven for simplicity and easy use
★ ARITHMETIC with stored calculations
★ FAST set-up and report formating
★ CLEAR user-oriented documentation
★ PRINTS totals & subtotals - mail labels
★ REFORMATS and merges data files
★ MULTI-DISK files: Up to 128K records
★ SORTS full disks on up to 40 fields
★ PRODUCTION input of repetitive data
★ USE existing data files
★ COUPLES to word processors
★ POSTS transactions to master file
★ SEARCH by strings, ranges, comparisons
★ DATA COMPRESSION: Over twice as many labels as the other system

For TRS-80* Models I, II, III, & 16 – 250.00
CP/M† – 295.00

CDC
13715 Vanowen St., Dept. CC
Van Nuys, CA. 91405
(213) 873-6621

**T.M. Tandy Corp.* *† T.M. Digital Research*

NOW AVAILABLE, CRT STAND FOR XEROX 820-822-860 COMPUTERS

FINALLY, A GOOD LOOKING QUALITY STAND ENABLING XEROX 820-822-860 USERS TO ELEVATE AND PIVOT THE CRT WHILE IMPROVING AIR CIRCULATION.
UNIQUE DELTA DESIGN, GIVES MAXIMUM SUPPORT USING LESS DESK SPACE THAN THE CRT ITSELF. STRONG ENOUGH TO SUPPORT 8" DISC DRIVES AND CRT. PIVOTS 180°.

THIS STAND MAY BE USED WITH *ANY* CRT DEVICE AND WILL ELEVATE THE CRT 3⅜", OPTIONAL ADJUSTABLE "FEET" ALLOWS INCREASED HEIGHT IF REQUIRED.

STEEL W/WOOD GRAIN VINYL FINISH $33.95
XEROX "PUTTY" COLOR FINISH $35.95
ALUMINUM W/XEROX "PUTTY" COLOR FINISH $42.95

SEND CASH, CHECK OR MONEY ORDER. VISA AND MASTERCARD BUYERS TELEPHONE TOLL FREE.

COMPUTER PERIPHERALS—
MATERIALS COMPANY
P.O. BOX 1045 DEPT SBO
WOODLAND HILLS, CALIFORNIA 91365
NATIONWIDE 800-428-7825 EXT. 43
CA. RESIDENTS ONLY
800-428-7824 EXT. 43

DEALERS AND DISTRIBUTOR INQUIRIES WELCOME

California Residents add 6% sales tax. Los Angeles residents add 6.5% sales tax. Can be shipped UPS, PARCEL POST. Weight 3 lbs. In the Continental U.S. add $2.50 postage and handling, $5 elsewhere. Xerox 820-822-860 Trademark and product of Xerox Corp. Patent pending CP-M Company 1982.

LIFETIME CERTIFIED DISCS

These high-quality blank discs from Allenbach Industries are guaranteed for a lifetime and have HUB REINFORCED RINGS. Sold in boxes of TEN.

5¼" double density
(Specify soft, 10 or 16 sectors)

Single sided	**$30.95**
Double sided	**35.95**
8" single density	**34.95**
8" double density	**40.95**

Write for full catalogue of EXCITING GAMES and product lines.

CDE 2463 McCready Ave
Los Angeles, California 90039
(213) 661-2031

Make a Living at "21"

A Blackjack Program unique in its ability to teach card counting strategies.

The program will effectively teach card counting strategies with more precision and speed than previously possible. Five proven strategies are taught, each with increasing complexity. Twelve user-alterable rules enable learning strategies specific to any casino in the world. Incorrect player actions are signaled and remembered for subsequent use. Other learning aids are also included, and of course normal casino-style black-jack can be played at any time. Comprehensive manual with 42 Las Vegas Casino game rules $10. Applicable to Software purchase only $80.

CP/M with cursor addressable screen.
Send Check or Money order to:

XANADU ENGINEERING
1653 Minorca, Costa Mesa, CA 92626
(714) 641-0686

CP/M is a trademark of Digital Research.

COMPUTERWARE®
products for

COLOR COMPUTER

SOFTWARE
Color Invaders • Pac Attack • Monitor •
Adventure Games • Text Editors • Assemblers •
PASCAL • Finance • Color Data Organizer
Starship Chameleon • Berserk
Scribe Word Processor
Address Factory • Home Money Manager
Forth • *FLEX software • Mazerace

HARDWARE
16 K / 32 K / 64 K Memory Expansions
Lower Case Adapter • Cables • Interfaces
• Printers

ACCESSORIES
Books • Cassettes • Supplies • Service Manuals

Dealer inquiries invited
*FLEX is a trademark of TSC.
Call or Write:

COMPUTERWARE®
Dept. C • Box 668
6809 Specialists Encinitas, CA 92024 • (714) 436-3512

Computerware is a trademark of Computerware

---HAVE YOU HEARD ABOUT
User-friendly software for your...

IBM PERSONAL® COMPUTER

...an Employee Payroll System
for the programmerless environment

PAYMASTER

- Hourly, salaried & commissioned reports
- Six user-defined deductions
- Federal tax reports
- Menu-driven selection
- Documentation
- User's Guide
- One-year support & update service

90-Day Unconditional Guarantee

Pay-Master	$449
Other Available Programs:	
File Master Data Base Management	$349
Sort-Master Sort/Merge System	$149

The Zentmeyer Company • Data Products Division
5312 West Crenshaw Street • Tampa, Florida 33614
Telephone (813) 885-5649

IBM PC® ⟷ MX-80®
OSBORNE I® ⟷ MX-80®

PARALLEL PRINTER CABLES

MX-80/Centronics® type parallel printer cables:
#I1 — IBM PC compatable — $35.00.
#O1 — OSBORNE I IEEE 488 port compatable — $35.00.

VERBATIM 5" SSDD soft sectored diskettes — $33.00/Box of 10.

—FREE SHIPPING, 10 DAY FREE TRIAL—

VISA, MASTERCARD, COD (ADD $2.00).
TX res add 5%.

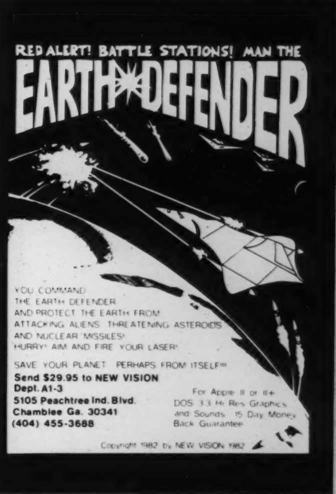
AUSTIN COMPUTER TECHNOLOGIES
Dept C P.O. Box 26595
Austin TX 78755
512-835-6136

Sinclair Place

Widest line of Hardware and Software for the Timex Sinclair 1000 and ZX 81 Computers.

Memotech
Thurnal Electronics
QuickSilva
Haven Hardware
Down East Computers
Abacus Electronics
Aerco
International Publ.
Including "Crakit"
J.P. Gibbons
Kopak Creations
Ksoft
Gladstone
M.C. Hoffman

Write, Sinclair Place for Hardware or Software Catalog (Specify) at P.O. Box 2288 Redmond, WA. 98052.



RED ALERT! BATTLE STATIONS! MAN THE
EARTH DEFENDER

YOU COMMAND
THE EARTH DEFENDER
AND PROTECT THE EARTH FROM
ATTACKING ALIENS THREATENING ASTEROIDS
AND NUCLEAR MISSILES!
HURRY! AIM AND FIRE YOUR LASER!

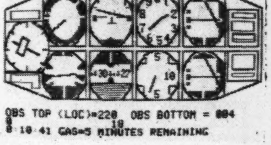
SAVE YOUR PLANET PERHAPS FROM ITSELF!!!

Send $29.95 to NEW VISION
Dept. A1-3
5105 Peachtree Ind. Blvd.
Chamblee Ga. 30341
(404) 455-3688

For Apple II or II+ DOS 3.3 Hi Res Graphics and Sounds 15 Day Money Back Guarantee

Copyright 1982 by NEW VISION 1982

1982 VERSION IFR SIMULATOR



```
OBS TOP (LOC)=220  OBS BOTTOM = 004
0              10
0 10 41 GAS=5 MINUTES REMAINING
```

APPLE II PLUS 48K DOS 3.3

A real IFR Simulator with X Y Plot and all the good stuff you used to pay $10,000 for. $50.00 at your Computer store, or direct from
PROGRAMMERS SOFTWARE
2110 N 2nd St
Cabot AR 72023
(501) 843-2988.

SPARTAN Electronics Inc.

CALL
(516) 499-9500

MAIL
6094 Jericho Tpke.
Commack, N.Y. 11725

Visit our Retail Store. Write for Catalog.

Franklin Ace 1000

Totally Apple compatible yet so much more.

Includes 64K of RAM, Upper/Lower Case, Numeric Pad and Visicalc keys.

FREE SOFTWARE 6 PAK

When you purchase a VIC 20 8K Exp 55.00 16K Exp 110.00

Volume Discounts

Min. Order $10.00
Shipping Overseas 20% Add'l
Prices subject to change without notice
COD 2.00 Extra

- Visa MC BAC Amex Check COD Money Order
- Add For Shipping

to 75.00	$2.50
76.00 to 250.00	$4.50
251.00 to 500.00	$6.00
501.00 to 750.00	$8.50
751.00 to 1000.00	$12.00
Over 1000.00	$12.50

Visit our Retail Store

(516)	Mon Th	Tu W F	Sa
499-9500	9-8	9-6	9:30-5

SAVE 40% on DISKS!

5¼" BASF	PRICE/10
1 side/double density	$26.70
2 side/double density	$37.10
1 side/80-Track Quad	$39.20
2 side/80-Track Quad	$52.90
5¼" MEMOREX free disk/box of 10 from Memorex	
1 side/double density	$25.60
2 side/double density	$36.40
1 side/Quad 96 PPI	$32.50
2 side/Quad 96 PPI	$44.20
5¼" VERBATIM	
MD525 1 side/DBL dens.	$27.30
MD550 2 side/DBL dens.	$44.20
MD577 1 side/77 Track	$37.10
MD577 2 side/77 Track	$44.20

All 5¼ Disks specify soft, 10 or 16 sector
8" Disks available at comparable savings!
Money order/Visa/MC/COD
Shipping $2. Mich-add 4% sales tax.
Call (313) 882-8705

J&K Systems
P.O. Box 51
East Detroit, MI 48021

The Apple's Core

Learn
APPLESOFT
COMPUTER
PROGRAMMING
FOR BEGINNERS

$49.95 (delivered)

Really teaches how to use and program the APPLE!

INSTRUCTIONAL/TUTORIAL MANUAL
An 'easy to read' guide.

(Disk 1) 14 TEACHING MODULES
Detailed explanations and examples of programming.

(Disk 2) 11 LEARNING TUTORIALS
Over 35 'hands on' programs.
EASY TYPE entry system.

For Apple II Plus*48K*DOS 3.3

Send cheque or money order to:

THE PROFESSOR
P.O. Box 301 Swanton, Vermont
05488 (514) 747-9130
Write for FREE catalog

COMPLETE COMPUTER SYSTEMS FOR UNDER $3000.00

THE NEW CC SYSTEM:
Z80 Processor 4MHz,
64K RAM, 2 Serial Ports,
1 Parallel Port,
2 8" Drives—1.6 MB Storage,
Microline-80 Printer, Adds
Viewpoint Terminal.
Complete Retail Price $37.45
30-Day Special $29.96

Custom Systems Development
114 Pattie
Wichita, KS 67211
(316) 262-1415

Order Yours Today!

SUPER SALE
FOR APPLE II®

DISK DRIVES	$279.95
16K RAM BOARD	$ 49.95

Run Pascal Applesoft/Integer Basic, Etc.

To Order send check or money order To:

EVERTEK
P.O. Box 1311
Provo, Utah 84603
801 373-5389

Please add $2.00 shipping/handling.
In Utah add sales tax.

YOU CAN SAVE $$$

5¼" DISKETTES (Soft or Hard Sector) Box of 10

Single Side/Double Density	$25.25
Double Side/Double Density	$31.25

Altos • North Star • Zenith Data Systems

RIBBONS FOR:

Anadex DP 9500/9501	$14.00
Centronics 700 Series	
Zip Pack (Package of 3)	$ 8.25
Cartridge	$ 8.50
D.E.C. LA-34 (Box of 6)	$30.00
Diablo 630 (Box of 6)	$25.90
Epson MX 70-80	$12.95
NEC Spinwriter (Box of 6)	$24.00
Okidata Microline 80 (Pkg of 3)	$ 8.90
Qume (Boxes of 6)	
(Black)	$19.00
(Red, Green, Blue or Brown)	$16.00
Texas Instruments 810 (Bx of 6)	$19.00

Plus many others - Call for more information

CHECK - MASTER CARD - VISA Accepted
Add $3.00 for Shipping & Handling:
Illinois Residents Add 6% Tax

ILLINOIS COMPUTER PRODUCTS CO.
P.O. Box 112
Mt. Prospect, IL 60056 **(312) 228-5590**

SINCLAIR ZX80/1
TIME X 1000

I/O Board with our Real Time Clock/Calendar

Time	Month	Date	Year	Day of wk
23:59:59	12	31	99	7

●8 Outputs capable of driving relays ●8 TTL Compatible inputs ●Battery back-up for clock ●All software included ●Feed through Sinclair Bus connector to allow normal expansion ●Output lines expandable through Multiplexing ●5 volt regulator ●90 day warranty.

Future products used with I/O board:
● Touch Tone™ encoder/decoder
● Speech and Sound synthesizer

Model	Description	price
310	I/O port with real time clock*	$49.95
315	PC board and manual of #310	$24.95
320	A to D and D to A converter*	$39.95
325	PC board and manual of #320	$19.95
330	Wireless control system(BSR™)	$54.95
340	Solidstate 25amp sw. modules*	$19.95
350	8 SPDT 5 amp relay board	$69.95
317	Clock IC and crystal (tested)	$12.95
	Shipping and handling	$3.95

* Built and tested Calif. residents add 6% tax
Mail order,check/moneyorders Foreign orders in US money Visa/Mastercard

JK AUDIO
P.O.Box 3295,Escondido, CA 92025 - 0580
Info. (714) 741 - 5132
24 hour order line only **NATL 800-227-1617**
Calif. Res. 800-772-3545 Ext. 367

– Professional –

REAL ESTATE SOFTWARE

for APPLE. TRS-80 & CPM SYSTEMS

- PROPERTY MANAGEMENT SYSTEM: $450

Tenant History	Operating Stmt
Late Rent Report	Building Reports
Vacancy Report	Utilities Report
Income Report	Tax Expense Report
Auto Late Charge	Prints Checks
Returned Checks	Prints Receipts

- PROPERTY LISTINGS/COMPARABLES: $325

— SCREEN BY →	Max/Min Price
22 Items/Listing	Max Price/Income
1000 Listing/Disk	Max Price/Sq Foot
Listing Memo Field	Min Cashflow

- REAL ESTATE ANALYSIS MODULES: $50/Module

Home Purchase	Tax Deferred Exchange
Income Prop Analysis	APR Loan Analysis
Property Sales	Loan Amortization
Construction Cost/Profit	Depreciation/ACRS Analysis
Loan Sales/Purchase	Loan Wrap Analysis

- WORD PROCESSOR — WORD STAR: $295

master charge VISA

Realty Software Company™

At Computer Stores Everywhere
or Order COD Direct
Cal Residents add 6½% Sales Tax

(213) 372-9419

Suite E 1116-8th Street Manhattan Beach CA 90266

YOU ARE GOING TO SMILE!

--When you see our Computer 'Source-Book©'...over 2,000 books,software, and accessories for all major brands. A few examples are listed here:

Introduction to Word Processing	$12.95
How to buy the Right business computer	$8.95
Business System Buyers Guide	$ 7.95
Using Micros in Business	$ 9.95
Your Home Computer,an intro guide	$12.95
Computer Dictionary	$15.95
How to computerize your business	$ 7.95
How to make money with micros	$12.95
1001 things to do with your micro	$ 7.95
Computer Graphics Primer	$14.95
Guide to Atari™ 400/800 systems	$16.95
Atari™ games and recreations	$12.95
Atari™ Sound and Graphics	$ 9.95
Inside Atari™ DOS	$19.95
80 Time saving programs / TRS-80™	$ 9.95
Intro to TRS-80™ Graphics	$11.95
55 TRS-80™ Color Computer programs	$ 9.95
TRS-80™ Color Computer Graphics	$14.95
Understanding Your Vic-20	$11.95
Computer "Source Book",2000 items	$2.00

Orders under $25.00 add $2.50 for handling. MasterCard or Visa accepted on orders over $25.00,send card #;expiry date,bank # on MC

DEALERS INQUIRIES WELCOME

JMC

"THE SOURCE" For:
Personal Computer Software.
Books. Games &
Accessories

DEPARTMENT: G-9
1025 Industrial Dr., Bensenville, IL 60106

SINCLAIR/TIMEX
products
Touch-a-Matic™
(212)
757-8698

MODEMS

$99.95

easy to use
accurate
direct connect
300 baud

LEX-11	$129.95
Signalman	$ 99.95

Call/Write for Catalog

PRINTERS

many
brands to
choose from!!!

from $375

Starwriter F-10
Epson
Anadex

CALL for prices

Diskettes 6 1/4" $27.50/10

THE LAST ONE®

THE PROGRAM THAT WRITES PROGRAMS

AVAILABLE FOR

CP/M
Apple II Plus
Sharp PC 3201
TRS - 80 MOD II
North Star Advantage

Still Only $600.00

Dealer Inquiries Invited

Send to **KROWN COMPUTING**
1282 Conference Dr., P.O. 66763
Scotts Valley, CA 95066
(408) 335-3133

PC/FORTH

Complete FORTH program development systems for the IBM® Personal Computer. Packages include interpreter/compiler with virtual memory management, line editor, custom screen editor, assembler, decompiler, utilities, file and record access modules, and many demonstration programs. 100 page user manual $100.00

Floating point arithmetic extensions and cross compiler available at additional cost.

Ready to run under PC-DOS or CP/M-86® Standalone version available soon. 64 kbytes RAM and two disk drives recommended. (IBM is a registered trademark of International Business Machines Corp. CP/M is a registered trademark of Digital Research, Inc.)

Laboratory Microsystems
4147 Beethoven Street
Los Angeles, CA 90066
(213) 306-7412

The Quality Leader in

COLOR COMPUTER GAMES

send for our FREE FLYER more coming soon

ARCADE GAMES

Space Invasion
ASTRO BLAST
BERSERK
CAVE HUNTER

Cassette (16k) $24.95
Disc. (32k) $29.95

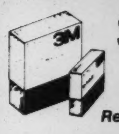
ADVENTURE GAMES

Calixto Island
The Black Sanctum

Cassette (16k) $19.95

Pre paid shipping on domestic orders
Over seas add $3.00
California residents add 6% tax

MARK DATA PRODUCTS
23802 Barquilla • Mission Viejo, CA 92691
(714) 768-1551



Scotch® diskettes

A brand you can trust!
Reliable and dependable!

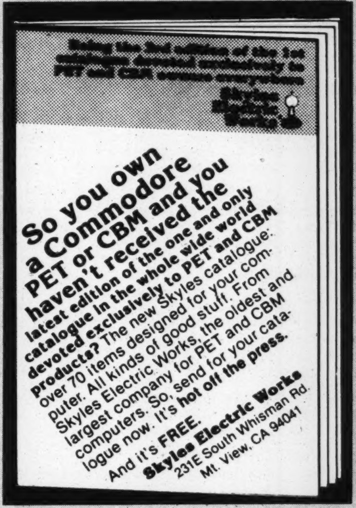
OUR PRICES HAVE NEVER BEEN LOWER!

By the box or by the case, they're ready for immediate shipment!

Call COLLECT to Order!
(805) 484-8146

QUALITY DATA SUPPLY
P.O. Box 236, Camarillo, CA 93011

Authorized Distributor
Information Processing Products
3M



So you own a Commodore PET or CBM and you haven't received the latest edition of the one and only catalogue in the whole wide world devoted exclusively to PET and CBM products? The new Skyles catalogue: over 70 items designed for your computer. All kinds of good stuff. From Skyles Electric Works, the oldest and largest company for PET and CBM computers. So, send for your catalogue now. It's **hot off the press.**

And it's **FREE.**

Skyles Electric Works
231E South Whisman Rd.
Mt. View, CA 94041

BASF DISKETTES

5¼" SS/DD Softsector	$1.99 each in boxes of 10
5¼" DS/DD Softsector	$2.99 each in boxes of 10
5¼" DS/DD Hardsector	10 Sector $2.99 each in boxes of 10
5¼" DS/DD Hardsector	16 Sector $2.99 each in boxes of 10
8" SS/SD Softsector	$1.99 each in boxes of 10
8" SS/SD Softsector	$2.99 each in boxes of 10
8" DD/DD Softsector	$3.60 each in boxes of 10

Send Check or Money Order to:

SOUTHERN COMPUTER SYSTEMS
630 Main Street
Shelbyville, Kentucky 40065
or call (502) 633-5639

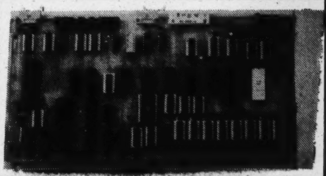
MEMOREX Diskettes

Top-quality Memorex Diskettes from **Tech•Data**, your complete word and data processing supply center. Dealer inquiries invited.

Call Toll Free
1-800-237-8931.
In Florida, call
813-577-2794.

Tech•Data Corporation
3251 Tech Drive North
St. Petersburg, FL 33702

HY-TYPE 1 & 11 • QUME



INTELLIGENT PRINTER INTERFACE

16,000 BYTE BUFFER / STAND ALONE
PARALLEL / SERIAL INPUT (BAUD RATES - 50 to 19,200)

OPTIONS INCLUDE: GRAPHICS • REVERSE PRINT • BOLD PRINT
UNDER-SCORE • REPRINT OF BUFFER
ADJUSTMENT OF LINES PER-INCH
CHARACTERS PER-INCH SELECTION
DOUBLE LINE

CUSTOM OPTIONS ALSO AVAILABLE

A & T FROM $450.00 BARE BOARD FROM $125.00

MASTER CARD & VISA ACCEPTED

WARN ELECTRONICS, LTD.
PO BOX 526 KNIGHTDALE, NC 27545 (919) 266-9411

MICRO-WINDOW

6502 TRAINING/DEVELOPMENT PROGRAM

HOME • SCHOOL • INDUSTRY

Micro-Window uses HI-RES graphics to display a programming model which shows, in binary, the contents of all 6502 registers as machine language instructions are executed.

Micro-Window completely simulates a microprocessor system with 2K of RAM starting at address zero. Programs can be loaded into the 2K RAM and run while observing their execution in the model, or instructions can be entered one at a time and immediately executed to see their effect on the current state of the model.

Very Easy To Use

APPLE II PLUS
48K DOS 3.3

$120

WINDOW RESEARCH
13452-A N.E. 175th Suite 218
Woodinville, Washington 98072

SPORTS COMPLEX

Football — Baseball— Golf

3 Realistic Sports Simulations— **All 3 for $30**

Football (Integer) has all the action of the real game in text. Play against the computer or your friends.

Baseball (Applesoft or Integer) uses real player stats. Manage the pros (12 teams on disk, 4 on tape) — or build your own favorites.

Golf (Applesoft or Inter) 18 holes of hi-res action for 1 to 4 players.
All fully supported. Specify tape or disk

Apple II or Apple II+

WOLFFWARE, 2004 E. Kensington, Shorewood, WI 53211

WARNING: Frequent use may cause addiction.

creative computing CLASSIFIED

CLASSIFIED RATES: Per Word, 15 Word Minimum. **REGULAR:** $2.00. **EXPAND-AD®:** $3.00. Ads set in all bold type at 20% premium. Ads set with background screen @ 25% premium. **GENERAL INFORMATION:** Prepayment discounts available. Payment must accompany order except credit card—Am. Ex., Diners, MC, VISA (include exp. date)—or accredited ad agency insertions. Copy subject to publisher's approval; must be typewritten or printed. First word set in caps. Advertisers using P.O. Boxes MUST supply permanent address and telephone number. Orders not acknowledged. They will appear in next available issue after receipt. Closing date: 5th of the 3rd month preceding cover date (e.g., April issue closes Jan. 5th). Send order & remittance to: Classified Advertising, CREATIVE COMPUTING Magazine, 1 Park Avenue, New York, N.Y. 10016. Direct inquiries to Candi Huggins, (212) 725-3927.

SOFTWARE

RETIREMENT PLANNING—$29.95. for Atari. Advanced financial planning, 20922 Paseo Olma, El Toro, CA. 92630.

ONLY $9.95! 100 Easy Input Business and Graphic Programs for all MICRO COMPUTERS using basic. MURPHY & ASSOCIATES, P.O. Box 165, Brandon, Mississippi 39042. (601) 939-9500.

PLAYER/MISSILE TOOL KIT for Atari 400/800. (16K) Create exciting, fast-action graphics using straight forward BASIC. Kit facilitates rapid horizontal and vertical movement, collision detection and player creation. Demo program and complete documentation. Indispensable for game development. $29.95 cassette. Sound Software, P.O. Box 16663, Seattle, WA 98116.

SCOTCH BRAND——a full line of quality personal computing supplies. Diskettes & cassettes for most systems. Educational specialists. Computing Services, 62 Idlewild Rd., Levittown, PA 19057. Free Data!

"CONSUMER" DRUG WATCHER——New Educational Programs for the informative use of 550 medications. Drug Information Program, and Drug Testing Program that tests your specific medications for potential 'Drug Interactions'. Applesoft/disk/48K $39.95. Medical Watch Software, 1620 Ensenada, Modesto, California 95355.

KISS-MONEY MAKING PROJECT via computer dating for schools, clubs. MICROSOFT BASIC listing, documentation, sample surveys for $7. DJ Bohlke, Coggon, IA 52218.

OPTION-INVESTING PROGRAM MAXIMIZES PROFIT. For Apple, TRS-80, IBM, $125. Free Brochure. OPTIONS-80, Box 471-C, Concord, MA 01742.

SINCLAIR ZX81/TS-1000/TRS-80 COLOR COMPUTER PROGRAMS. Wide Selection/High Quality. Catalog $1.00. Zeta Software, Box 3522, Greenville, SC 29608.

SCIENCE FAIR SOFTWARE. Nuclear Reactor Physics, Maxwell's Demon, Time Dilation, Wave-Particle Duality. Free details! Nuclear Software Systems, P.O. Box 1693, Melbourne, Fla. 32901.

RENT best selling Apple programs! Only $4 each. Over 100 titles. FREE CATALOG. CompuFun, Dept. CC, 5753G East Santa Ana Canyon Rd., Anaheim Hills, CA 92807.

TI-99/4A users—new game! "City Builder" cassette—USA + foreign: $19.95US Canada: $19.95Cdn (N.B. residents + 8%) cash, M.O., check. GIGO Software, Box 3461, Fredericton, N.B. Canada, E3A 5J8. U.S. Inquiries.

VOLCANOES—Fun, challenging, explosive. STAR SEARCH—out of this world! Earthware, Box 30039, Eugene, Oregon 97403. (503) 344-3383.

OSI C1P CLOSE-OUT SALE! Thirty-four outstanding programs on tape all for the "giveaway" price of $29.95! Includes Arcade, Strategy and Kaleidoscopic games, Utilities and Statistics. Send for free program summaries. Victory Software, 2027-A S.J. Russell Circle, Elkins Park, PA 19117.

APPLE II, CIVIL-ARCHITECTURE design software. Hydraulics, earthwork, beam design, structural, and hydrology. Brochure available. CIVIL WARE. 725 Gallup Road, Fort Collins, Colo. 80521, 303/221-3492.

ATARI SOFTWARE AT DISCOUNT PRICES. Queue's Comprehensive Catalog #10 Free. Queue, 5 Chapel Hill Drive, Fairfield, Connecticut 06432.

VIC 20 SOFTWARE. Free comprehensive catalog #11 (specify). Queue, 5 Chapel Hill Drive, Fairfield, Connecticut 06432.

APPLE SOFTWARE AT DISCOUNT PRICES. Queue's free catalog #12 (specify). Queue, 5 Chapel Hill Drive, Fairfield, Connecticut 06432.

AMENDED FEDERAL RETURN tax program for Apple II. Computes tax by tables, rates, and income averaging. Prepares and prints completed 1040X; overlays included. 1980 $39.95. 1981 $39.95. Both $64.95. Tax deductible. Taxwares, 17855 Bernardo Trails Place, San Diego, California 92128.

SEND FOR FREE CATALOG of quality software for TI-99/4 (a) from PROMETHEUS SOFTWARE, 413 Lowell Lane, Richardson TX 75080.

ATARI 400 KEYBOARD KIT— High quality, full travel upgrade for serious programming. Send for brochure. $79.95. S/WARE, 1341A Quail Hollow Rd., Harrisburg, PA 17112.

POPULAR BUSINESS/UTILITY SOFTWARE AT UNBEATABLE PRICES! For Atari, Apple, IBMPC, TRS-80. Write: Soft-Quest, P.O. Box 9663, Baltimore, MD. 21237.

FRENCH SOFTWARE—French Software for the Apple Computer: 50 programs entirely in French. Write for FREE Catalog: COMPUTERRE, C.P. 782, St. Laurent, Quebec, Canada, H4L 4W2, (514) 744-1608.

DOS HELPER: Easily search, read, modify, rewrite sectors; change DOS commands, error messages; alphabetize catalogs, restore deleted files etc. Only $29.95! THE PROFESSOR, P.O. Box 301, Swanton, Vermont 05488, (514) 747-9130.

MBASIC SMALL BUSINESS/home Data Management program for CPM computers—$25.00. Source listing (19 pages) $15.00. CC Consulting, 1565 East 775 South, 8, Ogden, Utah 84404.

HARDWARE

IBM BOARD. 64K—½ Megabyte on single board. 64K $395.00, Warranty. Applied Logic, Inc., Box 328, Jamaica, NY 11415. (212) 459-4064.

COMPUTER CONSULTANT

SPACE CITY SOFTWARE——Business System/Software Consulting, Design, Programming, Training, Support. CP/M Specialist. Houston (713) 465-3131.

COMPUTER EQUIPMENT/SUPPLIES

OPTICAL COMMUNICATOR or Data Link receiver, Transmitter; all electrical parts, lenses, instructions, $9.95 each. Both $18.50. $1.00 postage/handling Specify digital or analog. Peko, Box 5476, Sherman Oaks, CA 91413.

ELEPHANT FLOPPY DISKS 5″/8″——(10/Box)—5″ SSSD/soft $21.96, $20.96/2+; SSDD $24.96, $23.96/2+; DSDD $32.49, $30.96/2+. Double density available soft/10/16 sector (specify). 8″ SSSD $24.96, $23.96/2+. Shipping $2/order. Add NJ sales tax if applicable. Write for other prices, info. Direct-to-Tape Recording Company, 14 Station, Haddon Heights, NJ 08035.

EPROM ERASER $49.95. Erases all UV Eproms, 90 day warranty, send orders to: LOGICAL DEVICES INC., 781 W. Oakland Blvd, Ft. Lauderdale, Florida 33311, (305) 776-5870.

PET JOYSTICK INTERFACE—Allows all PET/CBM computers to accept either Apple joysticks/paddles or Atari joysticks. No assembly. Ready to plug into the user port. Software provided. Only $49.95. Michigan residents add 4% sales tax. J Systems Corp., 1 Edmund Place, Ann Arbor, Michigan 48103. 313-662-4714.

APPLE ADC-DAC/16 parallel ports/software ... $129 kit, $189. Assembled. Send $2.15 for details and PC/IC solder practice board. NALAN Computer Specialties, Dept. CC1, 106 Highland Park Lane, Boone, NC 28607.

BIG APPLE COMPUTERS AND ELECTRONICS—144-33 38th Avenue, Flushing, NY 11354. (212) 886-3727. Discounts on Software for Apple, Atari, TRS-80, CPM. Hardware, Peripherals and more. Call for great savings.

BUYING OR SELLING COMPUTER EQUIPMENT? List with us: METROPOLITAN COMPUTER CLEARINGHOUSE, P.O. Box 933, Burnsville, MN 55337, (612) 890-7115.

SERVICES

MAILING LISTS—C.I. Corporation. 1-800-854-2010 /1-714-450-1667. Call George Schaefer. 4000 Apple users—$395.00. 3000 Radio Shack users—$295.00. Also IBM/PC users.

CUSTOM KEYTOPS ENGRAVED for computer keyboards. REPLACEMENT KEYTOPS for word processing software also available. Arkay Engravers, 2073 Newbridge Road, Bellmore, NY 11710. (516) 781-9859.

BUSINESS OPPORTUNITIES

ATTENTION MICRO AND MINI COMPUTER OWNERS. Inventive new method of monitoring investments with your computer, will allow you to set up your own office at home, and bring in greater income. Complete package $45. includes postage/handling. Write for information or send Check/Money order to: C.B.A.S., P.O. Box 163, Ontario, Ohio 44862.

"HOW TO MAKE MONEY WITH YOUR HOME COMPUTER." 2 Cassette package with booklet. Send $14.95 plus shipping to: COMPUTER RESOURCES, 1659 Mills Street, CHULA VISTA, California 92010.

COMPUTER CASH. 101 Exciting, new spare-time home businesses. $4.50. Research. Box 22485CR, Houston, TX 77227.

COMPUTER CLUB

GOLD COAST COMPUTER RENTAL CLUB — Apple/TRS-80 Software, Firmware, Hardware, Publications. For Free Brochure and details write: Route 1, Bremen, Kentucky, 42325, 502-754-5313.

COMPUTER PUBLICATIONS

HOW TO MAKE MONEY WITH YOUR MICRO. Hard-back, 168 page guide shows how ... Money back guaranteed ... Send $14.95 to RH Publications, P.O. Box 105/C, Sullivan, Illinois, 61951. $1 for complete book list.

THE FUTURIST: A journal of forecasts, trends and ideas about the future. Bi-monthly publication exploring tomorrow. $20.00/year—money back guarantee. Write: Dept. C, 4916 St. Elmo Avenue, Bethesda, Maryland 2081.

FOR SALE/BARTER

TELETYPE 4320 KSR TERMINAL w/modem for sale. 1981 model, like new, only used 50 hours. Make your offer to Dick Blades (702) 831-6166, POB 6878, Incline Village, Nevada 89450.

TELETYPE EQUIPMENT for experienced computer enthusiasts and beginners. Teletype machines, parts, supplies. Catalog: $1.00. ATLANTIC SALES, 3730 Nautilus Ave., Brooklyn, NY 11224. (212) 372-0349.

RESISTORS, ¼W½W5% C.F. 3¢ ea., 1% metalfilms. No minimums. Cabinet Assortments. Quantity Discounts. Details from JR INDUSTRIES, 5834-G, Swancreek, Toledo, OH 43614.

APPLE-FLASHCARDS: Enjoyable 4 function math learning aid for children. $8.00/Disk. Send check/Money order to: SEK, 134 Laurelwood Drive, Pittsburgh, PA 15237.

GAMES

"SPART"——AN EXCITING COMBAT Game for RS extended basic color computers with joysticks. Send $7.95 for Tape to EAG Enterprises, P.O. Box 722, Payson, Arizona 85541.

IBM PC PRODUCTS

FREE PC INFORMATION, RGB Color Cables, Graphics Software and Booklet—"CHOOSING COLOR MONITORS." J.C. Strick & Associates, 949 S. Southlake Drive, Hollywood, Florida 33019.

TIMEX/SINCLAIR

ZX81/TS1000 8K/16K Checkers. Aggressive game, outstanding graphics. $9.95. + $1.50 postage. B&B Software, 1425 Lucy Lane, Madison, Wisconsin 53711.

TIMEX SINCLAIR 1000, 2K RAM BASIC, with 16K Ram module, cassette recorder and custom design attache case for $269.95 plus $4.50 shipping. COMPUTA-DEK, 6009 Kenwood Drive, Nashville, Tennessee 37215.

TRS-80 COLOR COMPUTER PRODUCTS

HIGH QUALITY 16K SOFTWARE. Entertainment, Education, Business. Send SASE for FREE catalog. ILUME DESIGN, 4653 Jeanne-Mance St., Montreal, Quebec, Canada H2V 4J5. U.S. Inquiries.

creative computing RETAIL ROSTER

A DIRECTORY OF STORES AND THE PRODUCTS THEY CARRY

TO PLACE A LISTING CALL COLLECT: LOIS PRICE (212) 725-7226

ALABAMA

VILLAGE COMPUTERS, 1720 28th Avenue South, Homewood, 35209. (205) 870-8943. Apple, Vector, Graphics, Peripherals, Software, Training and Service.

ARIZONA

PHOENIX — HEATHKIT ELECTRONIC CENTER, 2727 W. Indian School Rd. (602) 279-6247. Heath/Zenith Computers, Software, peripherals.

TUCSON — HEATHKIT ELECTRONIC CENTER, 7109 E. Broadway. (602) 885-6773. Heath/Zenith Computers, Software, Peripherals.

SIMUTEK COMPUTER PRODUCTS, 4897 East Speedway, 9881 East Skyview, Tucson, Apple, TRS-80, Xerox, Corvus, Tons of Software, Disk Drive and Printers.

DATA CONCEPTS, PHOENIX—602-242-9961, Tempe—602-968-2122, Scottsdale—602-990-3366. Atari, Apple, Franklin, NEC, Televideo, Commodore, Texas Instruments.

ARKANSAS

ABACUS — 248 Oak St., Conway 72032. (501) 329-9050. Atari, Commodore, Hewlett-Packard. Business/Personal Software, Magazines, Supplies. Free Consultation. Credit cards. We'll ship anywhere.

GAME SHOP — Ft. Smith. Computer games for TRS-80/Apple/Atari. 7 days/week.

CALIFORNIA

D.E.S. DATA EQUIPMENT SUPPLY—8315 Firestone, Downey 90241. (213) 923-9361. VICVILLE: (714) 778-5455. Commodore PET, Commodore 64, Vic 20 specialists. Latest Software, Hardware, Books, Supplies, Peripherals in stock.

OMNI UNLIMITED; 105 S. Los Robles; Pasadena; 91101; 213-795-6664; Commodore, Zenith, Otrona, Victor, Supplies/Peripherals.

ANAHEIM—HEATHKIT ELECTRONIC CENTER, 330 E. Ball Rd. (714) 776-9420. Heath/Zenith Computers, Software, Peripherals.

CAMPBELL—HEATHKIT ELECTRONIC CENTER, 2350 S. Bascom Ave., (408) 377-8920. Heath/Zenith Computers, Software, Peripherals.

EL CERRITO — HEATHKIT ELECTRONIC CENTER, 6000 Potrero Ave., (415) 236-8870. Heath/Zenith Computers, Software, Peripherals.

LA MESA—HEATHKIT ELECTRONIC CENTER, 8363 Center Dr., (714) 461-0110. Heath/Zenith Computers, Software, Peripherals.

LOS ANGELES—HEATHKIT ELECTRONIC CENTER, 2309 S. Flower St., (213) 749-0261. Heath/Zenith Computers, Software, Peripherals.

POMONA — HEATHKIT ELECTRONIC CENTER, 1555 N. Orange Grove Ave., (714) 623-3543. Heath/Zenith Computers, Software, Peripherals.

REDWOOD CITY — HEATHKIT ELECTRONIC CENTER, 2001 Middlefield Rd., (415) 365-8155. Heath/Zenith Computers, Software, Peripherals.

SACRAMENTO—HEATHKIT ELECTRONIC CENTER, 1860 Fulton Ave., (916) 486-1575. Heath/Zenith Computers, Software, Peripherals.

WOODLAND HILLS—HEATHKIT ELECTRONIC CENTER, 22504 Ventura Blvd., (213) 883-0531. Heath/Zenith Computers, Software, Peripherals.

VANGUARD DATA SYSTEMS, 8696 South Atlantic Avenue, South Gate, 90280, 213-564-6402, Mon-Sat, North Star, Televideo, Atari/CPM Software.

COASTAL COMPUTERS, 986 Monterey, San Luis Obispo 93401 (805) 543-9339. Apple, Osborne, Alpha Micro. Software, Peripherals, Supplies. Full Service Center.

P.C. COMPUTERS, 10166 San Pablo Ave., El Cerrito 94530. (415) 527-6044. Commodore Pet, Vic 20 Specialists. In House Maintenance.

LOTUS CENTURY, Westlake Shopping Center (Inside Mini Mall), Daly City, 94015, 415-992-5230. All Major Computer lines discounted.

BEST COMPUTER STORES, INC. 1122 B Street, Hayward 94541. (415) 537-2983. Apple, Compupro, Gimix, Osborne, Otrona, Panasonic.

BYTE SHOP OF HAYWARD, 1122 B Street, Hayward 94541. (415) 537-2983. Apple, Compupro, Gimix, Osborne, Otrona, Panasonic.

COMPUSALES—16819 South Hawthorne Boulevard, Lawndale 90260. (213) 370-3224. IBM, Victor 9000, Basis 108, Osborne, NEC, Apple.

THE SOFTWARE AFFAIR—10127 East Rosecrans, Bellflower, 90706. (213) 866-5206. Apple/TRS-80/Atari/T.I./Color Computer Software.

COMPUTERLAND—16720 South Hawthorne, Lawndale 90260. (213) 371-4624. IBM, Apple, Commodore, Osborne, Fortune. Software. Service. Computer Enlightenment.

COMPUTER STORE/San Leandro—701 MacArthur Blvd., San Leandro, CA 94577, (415) 569-4174. Atari, Altos, S100, Printers. Terminals, software, books, magazines, supplies.

COMPUTER SERVICE CENTER—Floppy disc drive repair S100 Sales/Service. Okidata Service. L.A., California 90038. (213) 851-2226.

PROGRAMS UNLIMITED, 11672 Ventura Blvd, Studio City, 90069. 213-763-3425. Hardware, Software, Peripherals, Magazines, Books. Talk to the pros today!

EXPERT TRAINING AND INSTALLATION. Systems Consulting. 265 Lynton Ave., Palo Alto, CA 94301. (415) 326-8605. Apple, Epson, Xerox, Diablo, etc.

ANAHEIM COMPUTER AND VIDEO, 3016 W. Lincoln Blvd., Anaheim, CA 92801, (714) 995-0224. Atari/O.S.I., Vick Games.

COLORADO

DENVER — HEATHKIT ELECTRONIC CENTER, 5940 W. 38th Ave., (303) 422-3408. Heath/Zenith Computers, Software, Peripherals.

ALPHA CENTER—12351 W. 64th, Arvada 80004. (303) 421-6361. SUNDAYS! Atari, T.I., Timex, Commodore, Corvus, NEC, Source, Epson, Prowriter. Repairs.

CONNECTICUT

COMPUTERWORKS—1439 Post Rd East, Westport 06880; (203) 255-9096. 12-6 Tues.-Fri., 12-8 Thu., 10-5 Sat.

THE COMPUTER STORE, 21 Atlantic St., Stamford, 06901. (203) 356-1920. Apple, Zenith, Sanyo, Diablo, Epson.

THE COMPUTER STORE, 683 Silas Deane Hwy, Wethersfield, 01609. (203) 563-9000. Apple, Zenith, Sanyo, Diablo, Epson

AVON — HEATHKIT ELECTRONIC CENTER, 395 W. Main St. (Rt. 44), (203) 678-0323. Heath/Zenith Computers, Software, Peripherals.

MULTI-BUSINESS COMPUTER SYSTEMS — 28 Marlborough Street, Portland, 06480, 203-342-2747, Complete Commodore Line, Hewlett-Packard, Northstar, Printers, CRT's.

COMPUTERCITY — 1475 New Britain Ave., West Hartford, 06110. (203) 521-2245. Apple, Epson, Corvus, NEC, Zenith. Hardware, Software, Peripherals. Service/Training.

COMPUTERCITY — 377 Temple St., New Haven, 06510. (203) 562-7546. Apple, Epson, Corvus, NEC, Zenith. Hardware, Software, Peripherals. Service/Training.

EAST HARTFORD—Computerifics, 1227 Burnside 06108. (203) 528-9819. Atari, Vector, NEC HW/SW. Apple, Vic SW. Books.

DELAWARE

THE COMPUTER STORE, 4010 Concord Pike, Rt. 202 North, Wilmington, 19803. (302) 478-7772, Apple, Zenith, Sanyo, Diablo, Epson.

MICRO PRODUCTS, 401 Philadelphia Pike, Wilmington, 19809, (302) 762-0227, Major brands of Hardware, Peripherals and over 75 Software lines represented.

COMPUTERLAND, ASTRO SHOPPING CENTER, Newark; (302) 738-9656. Authorized Sales/Service—IBM, Apple, Osborne, Software, Peripherals, Training.

FLORIDA

HIALEAH — HEATHKIT ELECTRONIC CENTER, 4705 W. 16th Ave., (305) 823-2280. Heath/Zenith Computers, Software, Peripherals.

JACKSONVILLE — HEATHKIT ELECTRONIC CENTER, 8262 Arlington Expressway. (904) 725-4554. Heath/Zenith Computers, Software, Peripherals.

PLANTATION — HEATHKIT ELECTRONIC CENTER, 7173 W. Broward Blvd., (305) 791-7300. Heath/Zenith Computers, Software, Peripherals.

TAMPA — HEATHKIT ELECTRONIC CENTER, 4109 W. Hillsborough Ave., (813) 886-2541. Heath/Zenith Computers, Software, Peripherals.

PROGRAMS UNLIMITED, 2550 Okeechobee Blvd., West Palm Beach 33409, 305-689-1200. Hardware, Software, Peripherals, Magazines, Books. Talk to the pros today.

NEW WORLD COMPUTERS, De Sota Square, Bradenton, 33505, (813) 748-6494. Sell/Lease, in stock—XEROX, APPLE, COMMODORE, SHARP, ATARI, VECTOR GRAPHICS, OSBORNE, PANASONIC, over 1,000 pieces of software, custom programming, in house repair, HANDS ON EXPERIENCE.

SOUTHERN MICRO COMPUTER, 15945 NW 57th Avenue, Miami Lakes 33014, (305) 621-4137, Discount prices on Apple/Sanyo, Miami area's oldest dealer.

COMPUTER SYSTEM RESOURCES, INC., GAINESVILLE—Butler Plaza (904) 376-4276. Apple, Osborne, Atari, Software, Peripherals, Classes, Service.

GRICE ELECTRONICS, Fort Walton, Panama City, Pensacola, 800-342-4646. (800-874-8398). Apple, Hewlett-Packard, 24 Hour Service.

MICRO COMPUTERS INTERNATIONAL, 1688 and 2420 Coral Way, Miami 33145, 305-856-5166. VIC-20, Atari, Apple, Zenith, Altos, Xerox, Sanyo, NEC, Okidata, Epson. 10 to 25% Discount on all personal computers and software.

GEORGIA

ATLANTA — HEATHKIT ELECTRONIC CENTER, 5285 Roswell Rd., (404) 252-4341. Heath/Zenith Computers, Software, Peripherals.

MENTOR TECHNOLOGY, 3957 Pleasantdale Road, Atlanta, 30340, 404-447-6236. Atari, Televideo, Sanyo, Altos, C. ITOH Printers and other CP/M Systems.

ILLINOIS

COMPUTERLAND/DOWNERS GROVE—136 Ogden Ave., Downers Plaza 60515, (312) 964-7762. 10-6 Mon.-Sat., 10-8 Tue., Thurs. IBM, Apple, Atari, Osborne, Fortune.

FARNSWORTH COMPUTER CENTER — 1891 N. Farnsworth Ave., Aurora 60505; (312) 851-3888. 10-8 Mon.-Fri., 10-5 Sat. Apple, Hewlett-Packard series 80 systems, HP Calculators, IDS Printers.

THE COMPUTER ROOM, 638 North Michigan, Chicago, IL. 60611. (312) 337-6744. New store at 131 West Madison. Apple, Televideo, Osborne. Business Program Specialists.

VIDEO ETC., 465 Lake Cook Plaza, Deerfield, 60015, (312) 498-9669. Other locations: SKOKIE (312) 675-3655, Orland Park (312) 460-8980, Buffalo Grove, (312) 459-6677, strong Hard/Software support for Apple, Atari.

DATA DOMAIN OF SCHAUMBURG, 1612 E. Algonquin Rd., Schaumburg, 60195. (312) 397-8700. 12-9 Mon.-Fri., 10-5 Sat. Apple, Osborne, Alpha Micro, Hewlett-Packard calculators. Largest book and Magazine selection.

COMPUTERS ETC. 2515 West 147th Place, Posen 60469. (South Suburbs of Chicago). Apple, Zenith Hardware/Software/Service. Complete Learning Center.

LOMBARD—COMPLETE COMPUTING—890 E. Roosevelt. (312) 620-0808: Apple, Atari, NEC, Altos, Dynabyte; Software, Peripherals, Classes.

COMPUTERLAND/LAKE COUNTY—Rtes 45 & 60, Mundelein—(312) 949-1300: IBM, Apple, Osborne, Altos, Fortune, Digital: 150 other manufacturers.

NILES—COMPUTERLAND—9511 N. Milwaukee Ave. 60646. (312) 967-1714: Apple, IBM Personal, Cromemco, Fortune, Osborne, Otrona: Software.

COMPUTERLAND/NORTHBROOK—3069 Dundee Road (60062). (312) 272-4703: IBM, Apple, Atari, Osborne, Altos, Vector: Software, Peripherals, Service.

COMPUTERLAND/OAK LAWN—10935 S. Cicero, Oak Lawn 60453; (312) 422-8080; IBM-PC, Apple, Atari, Osborne, Corvus, Dynabyte: Software, Peripherals.

ATARI SERVICE—Computers/Videogames, TRS-80, upgrades by appointment—Electronic Service, Route 150, Mansfield, 61854: (217) 489-3241.

HEATHKIT ELECTRONIC CENTERS—3462-66 W. Devon Ave., Chicago 60645 (312) 679-2270—224 Ogden Avenue, Downer's Grove 60515, (312) 852-1304—Heath/Zenith Computers, Software, Peripherals.

GALESBURG—MIDWEST INFORMATION SYSTEMS. 41 South Cherry 61401. (309) 342-7177. Apple, VIC-20, Peripherals, Software. Open 6 days.

THE SOFTWARE STORE—GLENVIEW—1767 Glenview Road, 60025, (312) 724-7730. Popular Micro Computer Software. Special Orders Specialists.

MAIN STREET COMPUTER—215 North Main, Decatur 62523. (217) 429-5505/1610 Broadway, Mattoon 61938. (217) 234-4404/313 East Monroe, Springfield 62701. (217) 753-8808/123 West Main, Taylorville 62568. (217) 824-4984. Apples, Hewlett-Packard Calculators, large stock of business, personal Software. Repairs.

MICRO COMPUTERS PLUS—349 East Main, Galesburg 61401. (309) 342-9572. All Systems/Home, Business. Classes, Service, Books.

ABC COMPUTER—SKOKIE—3361 Dempster, 60076. (312) 673-3550. Gamemaster, Telecommunication Experts. Business/Personal Computers. Software, Supplies, Service.

ABC COMPUTER—OAK LAWN 60076, 9010 Cicero (312) 423-2800. Gamemaster, Telecommunication experts. Business/Personal Computers. Software, Supplies, Service.

COMPUTERLAND/ARLINGTON HEIGHTS—270 West Rand Road, 60004. (312) 870-7500. Apple, IBM, Altos, Fortune, Xerox, DEC. Peripherals.

ALPINE COMPUTER CENTER—ROCKFORD—2418 S. Alpine, 61108. (815) 229-0200. Apple, Cromemco, Olivetti, OSI, VIC, Corvus, Peripherals.

IOWA

BEACON MICRO CENTER, 213 Lincoln Way, Ames 50010. (515) 233-4807. Apple, Atari, Nec Computers, Peripherals, Software, Service.

KANSAS

GAME SHOP — Wichita. Computer games for TRS-80/Apple/Atari. 7 days/week.

MISSION—HEATHKIT ELECTRONIC CENTER, 5960 Lamar Avenue; (913) 362-4486 Heath/Zenith Computers, Software, Peripherals, Service.

WICHITA—CUSTOM SYSTEMS DEVELOPMENT—114 Pattie 67211, (316) 262-1415. Ohio Scientific, Altos, SD Systems, CPM Software. Service.

KENTUCKY

LOUISVILLE—HEATHKIT ELECTRONIC CENTER—12401 Shelbyville Road, 40243. (502) 245-7811. Heath/Zenith Computers, Diablo Printers, Software, Peripherals.

LOUISIANA

THE COMPUTER PEOPLE—Apple, NEC, Osborne, Corvus Concept—Seminars, Sales, Service. Houma, Morgan City, Lafayette—1-800-352-5828.

COMPUTERLAND/LOUISIANA—312 St. Charles, New Orleans 70130. (504) 522-2255. IBM, Apple, Osborne, Fortune, Vector. #1 in service.

MARYLAND

COMPUTERS, ETC...13A Allegheny Ave., Towson, 21204. (301) 296-0520; 9330 Georgia Ave., Silver Spring, 20910. (301) 588-3748, 257 West St., Annapolis 21401. (301) 268-6505. Apple, Cromemco, Osborne, Northstar, Seequa. Sales/Service/training.

BASIK COMPUTERS INC. 307 North Frederick Avenue, Gaithersburg, 20877, (301) 840-0412, all Hardware/Software compatible with Apple, at discounts.

BALTIMORE—HEATHKIT ELECTRONIC CENTER, 1713 E. Joppa Rd., (301) 661-4446. Heath/Zenith Computers, Software, Peripherals.

ROCKVILLE — HEATHKIT ELECTRONIC CENTER, 5542 Nicholson Lane. (301) 881-5420. Heath/Zenith Computers, Software, Peripherals.

BETHESDA COMPUTERS—8020 Norfolk Ave., Bethesda 20814. (301) 657-1992. Apple Hardware/Software—Sales/Service/Peripherals and Accessories.

OLNEY COMPUTERS, 3414 First Ave., Olney 20832. Discount prices on Atari, NEC, Epson, Okidata, Commodore, Amdek.

MASSACHUSETTS

SCIENCE FANTASY BOOKSTORE — 18 Eliot St., Harvard Sq., Cambridge 02138; (617) 547-5917. 11-6 Monday-Saturday till 8 Thursday. Apple, Atari, IBM and TRS-80 games.

THE COMPUTER STORE, 120 Cambridge St., Burlington, 01803 (617) 272-8770. Apple, Zenith, Sanyo, Diablo, Epson.

THE COMPUTER STORE, 1678 Mass. Ave. Cambridge, 02138. (617) 354-4599. Apple, Zenith, Sanyo, Diablo, Epson.

THE COMPUTER STORE, 680 Worcester Rd, Framingham, Massachusetts 01701. (617) 879-3720. Apple, Zenith, Sanyo, Diablo, Epson.

THE COMPUTER STORE, 103 Devonshire St., Boston, 02109. (617) 426-4385. Apple, Zenith, Sanyo, Diablo, Epson.

PEABODY — HEATHKIT ELECTRONIC CENTER, 242 Andover St. (617) 531-9330. Heath/Zenith Computers, Software, Peripherals.

WELLESLEY — HEATHKIT ELECTRONIC CENTER, 165 Worchester Ave. (617) 237-1510. Heath/Zenith Computers, Software, Peripherals.

COMPUTERCITY—16 Front Street, Worcester, 01608. (617) 755-5464. Apple, Epson, Corvus, NEC, Zenith. Hardware, Software, Peripherals. Service/Training.

COMPUTERCITY — Vinebrook Plaza, Burlington, 01803. (617) 273-3146. Apple, Epson, Corvus, NEC, Zenith. Hardware, Software, Peripherals. Service/Training.

COMPUTERCITY — 420 Rutherford Ave., Charlestown, 02129. (617) 242-3350. Apple, Epson, Corvus, NEC, Zenith. Hardware, Software, Peripherals. Service/Training.

COMPUTERCITY — Hanover Mall Plaza, Hanover, 02339. (617) 826-9217. Apple, Epson, Corvus, NEC, Zenith. Hardware, Software, Peripherals. Service/Training.

COMPUTERCITY — 991 Mass. Ave., Cambridge, 02138. (617) 491-4638. Apple, Epson, Corvus, NEC, Zenith. Hardware, Software, Peripherals. Service/Training.

COMPUTERCITY—151 Endicott St., Danvers, 01923. (617) 774-7118. Apple, Epson, Corvus, NEC, Zenith. Hardware, Software, Peripherals. Service/Training.

COMPUTERCITY—50 Worcester Rd., Framingham, 01701. (617) 875-8126. Apple, Epson, Corvus, NEC, Zenith. Hardware, Software, Peripherals. Service/Training.

THE GAME SHOP—ACTON, 166 Great Road (01720): (617) 263-0418. N.E.'s largest selection of Game/Recreational Software.

BURLINGTON/SOFT SUPPLY INC.—68 Middlesex Tpk., 01803; (617) 229-6666. Supporting IBM, NEC, Digital, Apple Microcomputers.

HOME ENTERTAINMENT SHOWPLACE—757 Belmont, Brockton, 02401. (617) 588-1643. Atari, Commodore, Peripherals. Game/Business Software. Call now!

BRAINTREE—J.L. HAMMETT. Hammett Place 02184, (617) 848-1000. South Shore Plaza Store (617) 848-1000. Apple, all educational software, books.

MICHIGAN

COMPUTER CENTER — Garden City; (313) 425-2470 & West Bloomfield; (313) 855-4220; Hewlett-Packard Computers/Calculators, Apple, North Star. Large Selection of Software/Hardware.

COMPUTER CONTACT—3017 East Hill, Grand Blanc 48439. (313) 694-3740. Apple, Altos. Software, Peripherals, Service. Business/Education/Personal.

DETROIT—HEATHKIT ELECTRONIC—E. Detroit 48021: 18149 E. Eight Mile (313) 772-0416—Detroit: 18645 W. Eight Mile (313) 535-6480.

COMPUTERLAND—22000 Greater Mack Avenue, St. Clair Shores 48080. (313) 772-6540. Altos, Apple, Atari, DEC, Fortune, IBM, Osborne, Xerox.

MINNESOTA

ABS DATASYSTEMS CORP. — 905 St. Germain, St. Cloud 56301. (612) 253-8734. Ohio Scientific, M/A COM O.S.I., Authorized Distributor.

DIGITAL DESIGNS—ROCHESTER—1137 6th Street N.W. (55901), (507) 282-3222. Altos, Apple, Software, Peripherals. Service and Training.

ST. PAUL—HEATHKIT ELECTRONIC CENTER—1645 White Bear, (612) 778-1211. Heath/Zenith Computers, Software, Peripherals.

MISSOURI

CENTURY NEXT COMPUTERS — 1001 E. Walnut, Columbia, 65201; 314-875-8613/2120 Missouri Blvd., Jefferson City, 65101; 314-636-6502 — Apple, Osborne, Atari.

COMPUTER MART — 1904-B E. Meadowmere, Springfield, 65804, 417-862-6500. Apple, Commodore, IMS International, Software, complete Computer Bookstore, Business Specialist.

BRIDGETON/ST. LOUIS HEATHKIT ELECTRONIC CENTER—3794 McKelvey Road, 63044—(314) 291-1850: Heath/Zenith Computers: Software, Peripherals, Support.

COMPUTER ANNEX—411 South Campbell, Springfield 65806. (417) 864-7036. Black Apple Sales, Service, Supplies. We're education specialists.

ST. LOUIS—FORSYTHE COMPUTERS—7748 Forsyth Blvd., Clayton 63105. (314) 721-4300. Apple Dealer. Best in sales, Service, support.

MONTANA

THE COMPUTER STORE—BILLINGS—1216 16th Street, 59102. (406) 245-0092: Apple, Commodore, Hewlett-Packard: Software, Perpherals, Service.

NEVADA

HOME COMPUTERS — 1775 E. Tropicana #6, Las Vegas 89109; (702) 798-1022. Mon.-Sat. 10-7 Apple, Atari, Hardware/Software, Books & Service.

NEW HAMPSHIRE

COMPUTER MART OF NEW HAMPSHIRE, 170 Main St., Nashua, 03060. (603) 883-2386. THE Apple Specialists. Full line Hardware/Software. Training Service.

COMPUTERCITY — 527 South Broadway, Salem, 03079. (603) 898-2390. Apple, Epson, Corvus, NEC, Zenith. Hardware, Software, Peripherals. Service/Training.

COMPUTERCITY — 1525 South Willow St., Manchester, 03103. (603) 668-9527. Apple, Epson, Corvus, NEC, Zenith. Hardware, Software, Peripherals. Service/Training.

COMPU-CRAFT. 11 Dunbar Street, Keene 03431. (603) 357-3901. Commodore, Altos, Software. Buy right for education/business.

VIDEO STORE—140 Congress, Portsmouth 03801. (603) 431-1211. Osborne and Atari for your business/home. Software. Supplies.

NEW JERSEY

THE COMPUTER UNIVERSE — 155 Route 17S., Paramus 07652; (201) 262-0960. Mon; Wed; Fri., and Sat., 10-6. Tues., and Thurs; 12-9. 23 Rt. 206, Stanhope 07874 (201) 347-7892 Tues. & Thurs. 12-9; Wed., Fri. & Sat. 10-6. Specializing in Apple Computers.

SOFTWARE CITY, PINE BROOK — 101 Rt. 46 East, 07058; (201) 575-4574. Bus/Rec/Utility/Home programs for most microcomputers. Up to 20% off list.

STONEHENGE COMPUTER CORP., 89 Summit Ave., Summit 07901. (201) 277-1020. 10-6 M.-F., 10-5 Sat. Apple, Canon, Wicat. Authorized Dealer. Sales and Service.

COMPUTERLAND, 35 Plaza, Rt. 4 West, Paramus, 07652. (201) 845-9303. Apple, IBM, Vector Graphic, etc. We know small computers.

COMPUTERS, ETC...Plaza 38 Center, Rt. 38, Cherry Hill, 08002. (609) 779-0023. Apple, Cromemco, Osborne, Northstar, Seequa. Sales/Service/Training.

SOFTWARE CITY, TEANECK — 161 Cedar Lane, 07666. (201) 692-8298. Bus/Rec/Utility/Home programs for most microcomputers. Up to 20% off list.

SOFTWARE CITY, GREENBROOK — 60 Route 22 West, 08812. (201) 968-7224. Bus/Rec/Utility/Home programs for most microcomputers. Up to 20% off list.

ASBURY PARK — HEATHKIT ELECTRONIC CENTER, 1013 State Hwy. 35; (201) 775-1231. Heath/Zenith Computers, Software, Peripherals.

FAIR LAWN — HEATHKIT ELECTRONIC CENTER, 35-07 Broadway (Rt. 4), (201) 791-6935. Heath/Zenith Computers, Software, Peripherals.

COMPUTERLAND OF CHERRY HILL — Pine Tree Plaza, 1442 E. Rt. 70, Cherry Hill 08034. (609) 795-5900. Apple, IBM, Fortune.

SOFTWARE MART — 352 Bloomfield Avenue, Caldwell 07006, 201-228-4949. Software for Apple, Atari, TRS-80, Pet. 10-20% off list.

SOFTWARE CITY/SUMMIT — 3 Beechwood Rd., 07901. (201) 273-7904. Bus/Res/Utility/Home programs for most microcomputers. Up to 20% off List.

WAYNE SOFTWARE, 1459 Route 23, Wayne Tile Center, Wayne 07470, across from Packanack Center. Computers. Programs. Books. Peripherals. Discount Prices. 201-628-7318.

SOFTWARE CITY/FAIRVIEW—251 Broad Ave., 07022. (201) 943-9444. Bus/Rec/Utility/Home Programs for most Microcomputers. Up to 20% off list.

SOFTWARE ASYLUM, INC. — Rt. 9 South, Box 175, Old Bridge 08857. (201) 536-1401. Huge Selection for Atari — over 400 Programs available. Call for our catalog.

NEW YORK

UPSTATE COMPUTER SHOP — RD 1, Box 17A, Whitesboro 13492; (315) 768-8151. 10-6 Mon.-Fri., 11-5 Sat. Apple — Commodore — Data General.

ADVANCED COMPUTER SYSTEMS, 18 Market St., Potsdam, 13676. (315) 265-5620. Apple, Commodore, O.S.I. and Novell Data Systems.

CASTLE COMPUTERS, 720 New Loudon Rd., Latham, 12110. (518) 783-9405. M-F: 10-6, Sat: 12-5. Apple, Atari Hardware/Software.

COMPUTER WORLD — 4254 N. Buffalo Rd., Orchard Park, 14127. (716) 662-4141. M-F: 9-9, Sat: 9-5. Atari Hardware/Software.

FUTURE VISIONS COMPUTER STORE, 70 Broad Hollow Rd., Rt. 110, Long Island, 11747. (516) 423-7820. Apple, Osborne, Northstar, Ithaca Intersystems.

THE COMPUTER STORE, 221 East Post Rd., White Plains, 10601. (914) 428-1661. Apple, Zenith, Sanyo, Diablo, Epson.

THE COMPUTER STORE, 40 East 52nd St. N.Y.C. 10022. (212) 832-2180. Apple, Zenith, Sanyo, Diablo, Epson.

SOFTWARE CITY, PEARL RIVER—147 Kinderkamack Rd., Montvale 07645. (201) 391-0931. Bus/Rec/Utility/Home programs for most microcomputers. Up to 20% off list.

SOFTWARE CITY, MOUNT KISCO — 187 Main St. 10549 914-666-6036. Bus/Rec/Utility/Home Programs for most Microcomputers. Up to 20% off list.

AMHERST — HEATHKIT ELECTRONIC CENTER, 3476 Sheridan Drive., (716) 835-3090. Heath/Zenith Computers, Software, Peripherals.

JERICHO, L.I. — HEATHKIT ELECTRONIC CENTER, 15 Jericho Turnpike, (516) 334-8181. Heath/Zenith Computers, Software, Peripherals.

ROCHESTER — HEATHKIT ELECTRONIC CENTER, 937 Jefferson Rd., (716) 424-2560. Heath/Zenith Computers, Software, Peripherals.

N. WHITE PLAINS—HEATHKIT ELECTRONIC CENTER, 7 Reservoir Rd., (914) 761-7690. Heath/Zenith Computers, Software, Peripherals.

ADS OFFICE SYSTEMS, BOX 3210, Rt. 55, Poughkeepsie 12603. (914) 473-9400. User support: Apple, Hewlett-Packard, IBM-PC.

PROGRAMS UNLIMITED, 20A Jericho Turnpike, Jericho, Long Island 11753. (516) 333-2266. Hardware, Software, Peripherals, Magazines, Books. Talk to the pros today.

PROGRAMS UNLIMITED, Smith Haven Plaza, (Route 347) Smith Haven, Long Island 11755. (516) 724-4490. Hardware, Software, Peripherals, Books. Talk to the pros today.

PROGRAMS UNLIMITED, 131 Mamaroneck Avenue, White Plains 10601, (914) 761-9283. Hardware, Software, Peripherals, Magazines, Books. Talk to the pros today.

SOFTWORLD DISCOUNTS, 2412 Kayron Lane, North Bellmore, 11710, 516-826-6371, Apple, Atari, TRS-80, Software Discounted. Call M-F, 4-10.

BUSINESS COMPUTING INTERNATIONAL—342 Madison, NYC 10173. (212) 697-9400. Specialization Export: Archives, Wicat, IBM Series I, System 23 Datamaster, Arabic Conversion Packages, All Software.

PROGRAMS UNLIMITED, Rickel's Plaza, Commack, L.I. 11725. Opening Late October.

VIDEO VILLAGE, LONG ISLAND, 5060 A Sunrise Highway, Massapequa Park, 11762. (516) 799-1616. Long Island's Largest Atari Dealer. Great Software/Service. Catalog 25¢.

COMPUTER DISCOUNT SERVICES, 448 West 55th St., New York, 10019, 212-757-8698. Timex Sinclair, Atari, Texas Instruments Hardware, Software, Peripherals.

NORTH CAROLINA

GREENSBORO — HEATHKIT ELECTRONIC CENTER, 4620 W. Market Street, (919) 299-5390. Heath/Zenith Computers, Software, Peripherals.

PERSONAL COMPUTER CENTER, 2605 Chapel Hill Boulevard, Durham 27707, 919-493-5466, Raleigh 919-833-2240. Full Line of Apple Hardware/Software for Business, Education & Life.

COMPUTER & VIDEO CENTER — 1902 Clarendon Blvd., New Bern 28560. (919) 638-5030. Atari, Northstar, Altos. Specializing in Small Business Systems.

ALPHA-ONE COMPUTER AND CAMERA CENTER. Highpoint 27260. (919) 883-4013. Atari, NEC, Epson Authorized factory Service Center.

OHIO

ABACUS II — 1417 Bernath Pkwy., Toledo 43615; (419) 865-1009. 4751 Monroe St. (419) 471-0082. 10-6, 10-7 Thurs. Apple, Osborne, Adds, NEC, Atari, Epson & IDS Printers.

NORTH COAST COMPUTERS—626 Dover Center, Bay Village 44140; (216) 835-4345. 10-6 Mon.-Sat., 10-8 Tue., Thur. Apple/Atari/Vector Graphic/Data General.

PROGRAMS UNLIMITED, Golden Gate Plaza, Mayfield Heights, 44124. (216) 449-4030. Hardware, software, peripherals, magazines, books. Talk to the pros today!

MICRO CONCEPTS, 1655 Brittain Road, Akron, 44310, (216) 633-7740. Commodore, Atari, Onyx, Northstar. Full Service dealer, Classes, Custom Programming.

BARNHART STORES — 548 N. Main, Urbana 43078. (513) 653-7257. 8AM-5PM. Atari/Commodore at discount prices.

ELECTRONIC CONNECTION — 424 E. Stroop, Kettering 45429; (513) 294-0222 — Trojan Village Shopping Center, Troy 45373. Atari, Commodore, Timex — Home Computer Specialists.

OKLAHOMA

OKLAHOMA CITY — HEATHKIT ELECTRONIC CENTER, 2727 Northwest Expressway. (405) 848-7593. Heath/Zenith Computers, Software, Peripherals.

GAME SHOP — Norman, Stillwater, Oklahoma City, Tulsa. Computer games for TRS-80/Apple/Atari. 7 days/week.

TULSA—ABS COMPUTER CENTER—8518-E East 71st (74133), (918) 252-1604: Atari, Apple, Hewlett-Packard. Software, Peripherals, Training.

SYSTEMS PLUS—3407 South Boulevard, Oklahoma City, 73034. (405) 348-0862. NEC business applications, Atari, VIC-20, Peripherals for IBM.

ENID—Specialty Electronics (405) 233-1632. Atari, Commodore, Texas Instruments. All Software/Business Applications. Open 6 days/week.

OREGON

MICRO COMPUTER SUPPLIES, INC. 3809 Southwest Hall, Beaverton, 97005. (503) 643-0865. Kaycomp-2, Televideo, Xerox, Diablo, Dysan, 3M. Ribbons, Forms, Software.

THE COMPUTER STORE—2015 Northwest Circle Boulevard, Corvallis 97330. (503) 754-0811. Microcomputers/Peripherals sales and service. Training.

MAIL ORDER—COMPUTEROLA—P.O. Box 13748, Portland, 92713. (503) 239-4315. Atari, VIC-20, Epson, Okidata, Hayes. Software, Peripherals.

PENNSYLVANIA

CALDWELL COMPUTER CORP., 6720 Rising Sun Ave. Philadelphia 19111. (215) 742-8900. Apple, Commodore, Percom, Northstar Sales/Service.

COMPUTERLAND/HARRISBURG, 4644 Carlisle Pike, Mechanicsburg, 17055. (717) 763-1116. Apple, IBM, Xerox, Zenith. Sales, support and training.

ERIE COMPUTER CO., 2131 W. 8th St., Erie, 16505. (814) 454-7652. Apple, Commodore, OSI, Xerox, Atari, Huge inventory of Software.

MARKETLINE SYSTEMS INC., 2337 Philmont Avenue, Huntington Valley, 19006, (215) 947-6670. We sell and service MicroComputers and Peripherals for small business and industry.

STARGATE ENTERPRISES, 1111 Fifth Avenue, McKeesport, 15132, (412) 664-1111, hours: 10-6/Monday-Saturday. Authorized Atari dealer with Atari Information Center.

INTEGRATED MICRO COMPUTER SERVICE, 168 Madison, Rochester 15074, (412) 728-6331, authorized dealer of Atari, also selling Televideo, Quasar, Casio.

THE COMPUTER STORE, THE Philadelphia Center Hotel, Philadelphia, PA. 19103. (215) 567-6475. Apple, Zenith, Sanyo, Diablo, Epson.

20/20 COMPUTER, 2020 Hamilton Street, Allentown, 18104, (215) 439-1800. Atari, Apple, Durango, Hewlett-Packard, Data General, Zenith, Televideo. Hardware/Software and Peripherals.

PHILADELPHIA — HEATHKIT ELECTRONIC CENTER, 6318 Roosevelt Blvd. (215) 288-0180. Heath/Zenith Computers, Software, Peripherals.

FRAZER — HEATHKIT ELECTRONIC CENTER, 630 Lancaster Pike, (Rt. 30) (215) 647-5555. Heath/Zenith Computers, Software, Peripherals.

PITTSBURGH — HEATHKIT ELECTRONIC CENTER, 3482 Wm. Penn. Hwy. (412) 824-3564. Heath/Zenith Computers, Software, Peripherals.

COMPUTER FORUM—490 Lancaster Pike, Frazer, 19355. (215) 296-3474. Commodore/Altos/Atari—Hardware/Software; Epson. Service/Training.

CAMERART, The Court at King of Prussia, King of Prussia, 19406, (215) 337-2020. CAMERART, opening August 1982, Willow Grove Center, 2500 Moreland Road, Willow Grove, 19090, (215) 657-7272. Apple/Texas Instruments. Sales/Service. For Business Systems Call: (215) 544-8700.

PERSONAL SOFTWARE, 146 Paoli Pike, Paoli, 19355, 215-296-2726. SOFTWARE SPECIALISTS. Custom Programs, Canned Programs and Peripherals.

YORK—COMPUTERS UNLIMITED—2813 E. Prospect Road (17402), (717) 755-1045: Apple, IDS, VIC: Software, Peripherals—Full Service.

SOUTH DAKOTA

COMPUTER SYSTEMS DESIGN—2139 Jackson Blvd., Rapid City, 57701. (605) 341-3662. Apple, Vector Graphics. Custom Software. Restaurant Management!

RHODE ISLAND

THE COMPUTER STORE, 740 North Main, Providence 02904. (401) 331-0220. Apple, Zenith, Sanyo, Diablo, Epson.

COMPUTERCITY — 165 Angell St., Providence, 02903. (403) 331-2187. Apple, Epson, Corvus, NEC, Zenith. Hardware, Software, Peripherals. Service/Training.

WARWICK — HEATHKIT ELECTRONIC CENTER, 558 Greenwich Ave. (401) 738-5150.

TENNESSEE

VIDEO VISION STORE, 1645 Downtown West Blvd., Suite #3, #4, Knoxville 37919, 615-690-8800, Atari 400/800, Hardware/Software.

UTAH

MIDVALE —HEATHKIT ELECTRONIC CENTER, 58 East 7200 South. (801) 566-4626. Heath/Zenith Computers, Software, Peripherals.

VIRGINIA

COMPUTERS, ETC…6671 Backlick Rd., Springfield, 22150. (703) 644-5500. Apple, Cromemco, Osborne, Northstar, Seequa. Sales/Service/Training.

THE COMPUTER STORE, 6858 Old Dominion Drive, McLean, 22101. (703) 821-8333. Apple, Zenith, Sanyo, Diablo, Epson.

ALEXANDRIA — HEATHKIT ELECTRONIC CENTER, 6201 Richmond Hwy., (703) 765-5515. Heath/Zenith Computers, Software, Peripherals.

VIRGINIA BEACH — HEATHKIT ELECTRONIC CENTER, 1055 Independence Blvd. (804) 460-0997. Heath/Zenith Computers, Software, Peripherals.

SMALL BUSINESS COMPUTER CENTER, 2929 Virginia Beach Boulevard, Virginia Beach, 23452, 804-340-1977. Apple, Vectorgraphics, Alpha Micro, Commodore VIC 20.

ODYSSEY DATA PRODUCTS—9014 West Broad Street Road, Richmond, 23229. (804) 270-1992. Discount Software-Hardware-Peripherals for Apple, Atari, IBM, TRS-80, Xerox 820. Free Mail Order Catalogue.

WASHINGTON, DC

THE COMPUTER STORE, 1990 K Street N.W., Washington, D.C. 20006. (202) 466-3367. Apple, Zenith, Sanyo, Diablo, Epson.

WASHINGTON

SEATTLE — HEATHKIT ELECTRONIC CENTER, 505 8th Ave., N. (206) 682-2172. Heath/Zenith Computers, Software, Peripherals.

TUKWILA — HEATHKIT ELECTRONIC CENTER, 15439 53rd Ave., S. (206) 246-5358. Heath/Zenith Computers, Software, Peripherals.

VANCOUVER — HEATHKIT ELECTRONIC CENTER, 516 S.E. Chaklov Dr., (206) 254-4441. Heath/Zenith Computers, Software, Peripherals.

CENTRALIA—DSC COMPANY. 119 West Magnolia 98531. (206) 736-3240. Atari, Commodore, Helix/6809. Services, Consulting, and supplies.

TACOMA—ELECTRONICS SHOWROOM. 2504 Jefferson Avenue, 98402. (206) 272-2329. Atari/VIC Computers. Atari/Apple/TRS-80/Commodore Software. Supplies.

KENT VIDEO AND COMPUTERS—1415 West Meeker 98031. (206) 854-7629. Atari/Kaycomp-2/Commodore. Printers/Modems/Software/Books.

YAKIMA—ROB ROY COMPUTER SHOP—1109 West Yakima Avenue 98902. (509) 575-7704. Northstar, Atari, Software, Peripherals, Magazines.

ELLENSBURG—COMPUTERCRAFT. 115 West 4th 98926. (509) 925-3755. Popular Software/Hardware, Business/Personal. Books/Magazines. Classes. Services.

KIRKLAND—USS ENTERPRISE, 12091 124th Avenue NE 98033. (206) 821-5353. Game Software. Atari, Intellivision, Odyssey, Astrocade, Coleco.

ELECTRONIC SUPER MART—Parkway Plaza 98188, (206) 575-1093/3070 Kitsap Way, Bremerton 98310, (206) 377-3979. Commodore Business Machines. Parts.

WEST VIRGINIA

COMPUTERS PLUS, INC., 300 D Street, South Charleston 25303. (304) 744-2321. Atari, Intertec/Superbrain - Hardware/Software/Service/training.

WISCONSIN

COMPUTERLAND/MADISON—6625 Odana Rd., 53719, (608) 273-2020; 3205 E.Washington, 53704 (608) 241-2100. Apple, Osborne, IBM-PC, Xerox, Hewlett-Packard, Fortune.

COLORTRON COMPUTERS, 2111 Lathrop Ave., Racine, 53405. (414) 637-2003. Apple, Hardware and Software, C. ITOH Printers. Service/Training.

BLUE LAKES COMPUTING—Apple, Fortune, Osborne, Sony—Software, Service, Supplies—Madison (608) 233-6502—Brookfield/Waukesha (414) 785-1788—Maxell Diskettes $1.49, limit 3 per customer with coupon.

MILWAUKEE—COMPCO-7110 W. Fond-Du-Lac, 53218, (414) 438-0610: Apple, Altos, DEC, Osborne, Software, Peripherals, Service, Custom Programming.

MAGIC LANTERN—406 South Park Street, Madison 53715. (608) 251-9112. All Atari Products. 500 Programs in stock.

PHOTOART VISUAL SERVICE—840 North Plankinton, Milwaukee 53203. (414) 271-2270. Bell & Howell, Apple. Educational/Industrial Software.

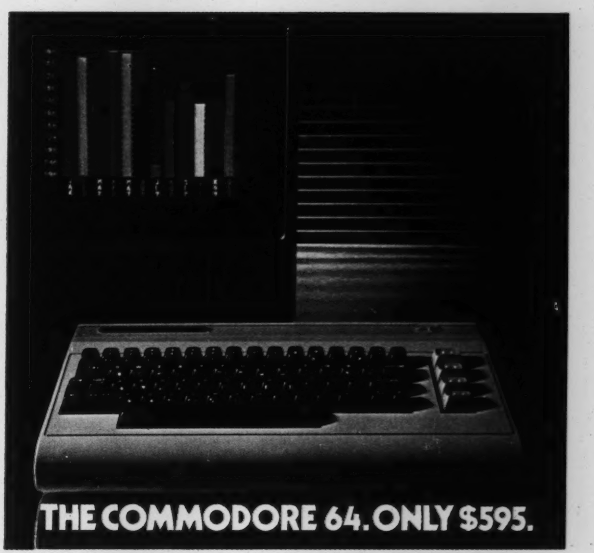
• index to advertisers •

Reader Service No.	Advertiser	Page
101	A2D Company	238
102	Aardvark Technical Services	51
103	Accent software	118
104	Advanced Operating Systems	189
105	Adventure International	110-111
106	ALF Products	82
107	The Alien Group	375
108	Alpha Byte Computer Products	206-207
109	Alpine Software	175
110	Alternative Software	94
111	Amdek Corporation	228
112	Apple Computer Corp.	102-103
113	Applied Software Technology	210
114	Archive	317
115	ARCsoft Publishers	225
116	Ark Computing	70
*	Artworx	146
*	Aspen Software	323
119	Associated Research Enterprises	416
118	Atari	112
120	Automated Simulations	211
117	Automated Simulations	27
121	Avalon Hill Company	185
122	B.A.S.F. Computer	25
123	BBI Mail Order	367
124	Beagle Brothers Micro Software	246-247
125	Big Five Software	13
126	Bit 3 Computer Corporation	295
127	Bottom Line	315
128	B.P.I. Systems	178
129	Broderbund Software	186-187
130	BT Enterprises	410-411
131	Business Machine Consultants	398
132	Calsoft	125
133	Central Point Software	8
134	Charles Mann & Associates	234
135	Chatsworth Data	255
136	Chrislin Industries, Inc.	262
137	Chromanetics Corporation	226
138	Chromasetts Magazine	286
139	CJM Industries	18
226	Cleveland Consumer Computers & Components	347
140	C-Load Magazine	287
141	Collins International Trade Corp.	241
142	Commodore Business Machines	Cov 3
143	Communications Electronics	181
144	CompuServe	154-155
145	Compushack	296-297
146	Computer Discount of America	255
370	Computer-Ed	341
147	Computer Exchange	40-41
165	Computer Learning Tree	238
148	Computer Mail Order East/West	282-283
149	Computer Outlets	279
150	Computer Plus	349
151	Computer Specialties	303
152	Computertime, Inc	371
153	Computer's Voice	365
154	Computer Warehouse	407
155	Computer World International	257
156	Computronics	293
157	Comstar	26
158	Connecticut Information Systems	92
159	Consumer Computer Mail Order	335
160	Control Data	132-135
166	Corona Data	2
161	Cosmic Computer's Unlimited	19
162	Cottage Software	238
167	Covercraft	61
163	CPU Shop	143
*	Creative Software	130
164	Creativity Unlimited	366
168	Curtis Manufacturing	363
169	Dakin 5	11
170	Datamost	54
171	Datamost	55
172	Datamost	56
173	Datamost	57
174	Datasmith	347
175	Davidson & Associates	377
176	DDL Software	398
197	Decision Support Software	377
374	Decision Support Software	377
178	Dickens Data	18
*	Digital Equipment Corporation	122-123
179	Dilithium Press	359
180	Discount Data Products	106-107
181	Don't Ask Computer Software	183
182	D/Punch Company	405
183	Dresselhaus Computer Products	234
184	Dynacomp	274-275
185	800 Software	49
187	Educational Activities	236
188	Educational Activities	347
189	Educational Audio Visual, Inc.	361
186	E&L Instruments	68
190	Electronic Specialists	356
191	Epson America	176-177
365	Excalibur Technologies Corp.	74
372	ExecSystems Software	404
192	First Star Software	121
193	Floppy Disk Services	339
360	Focus Media	129
195	Formaster	31
196	Franklin Computer	109
219	Gamestar	202
177	Genie Computer Corporation	104
228	Gladstone Electronics	366
200	Gold Disk Software	242
201	Great Plains Software	145
222	Happy Hands	340
203	Hayden Software	53
*	Hayden Software	269
204	Hayes Microcomputer Products	46
*	Heath Company	115-117
205	Huntington Computing	309
206	IBM Corporation	172-173
207	IJG Computer	32
208	IJG Computer	205
*	Infocom	140-141
209	I/O Management	335
210	Jade Computer Products	265-267
211	JDR Microdevices	277
212	Kelly's Computing	251
213	Kensington Microware	90
214	Kensington Microware	258
215	Kern Publications	213
216	Krell Software	72
217	Krell Software	50
199	Leading Edge	9
218	Leading Edge	Cov 4
220	Learning Tools, Inc.	401
221	Little, Brown	357
202	LNW Research	17
223	LNW Research	380
224	Lowerne Ltd.	405
225	Lyco Computer	413
227	Mail Comp	272
198	Maxell	5
229	Meridian	342
230	Micro Business World	261
373	Micro Computer Service Center	416
371	Microcomputer Technology Inc	227
231	Micro D	23
232	Micro House	28-29
233	Micro Lab	127
234	Micro Learningware	280
235	Micro Management Systems, Inc	355
236	Micromint, Inc	361
257	Micro Mountain	169
239	Microsystems Exchange	174
240	Micro Systems Software, Inc	409
272	Micro Systems Software, Inc	192
238	Micro-Systems	369
241	Microware Dist. Inc	417
242	Micro Works	353
243	M-R Information Systems, Inc.	405
245	Muse Software	128
246	Muse Software	260
247	National Software	88
248	NEC Information Systems, Inc.	191
249	Neeco	319
251	Newport Machine Design	210
250	Nexa Corporation	263
*	NRI Schools	65-67
252	Odesta	131
255	Omega Microwave	362
254	Omega Microwave	325
283	Omega Microwave	136
287	Omega Sales	252
237	Omni Resources	96
259	Optimized Systems	280
260	Optoman Consumer Products	401
261	Orange Micro	76
262	Pacific Exchanges	280, 365, 367, 398
263	Pacific Polytech	255
264	Pan American Electronics	367
265	Pathway Software	377
266	Peek & Poke Software	377
267	Penguin Software	224
268	Peripherals Unlimited	34
269	Perry Oil & Gas	333
270	Personal Computer Age	327
271	Picadilly Software Inc	60
272	Powersoft	192
273	Practical Peripherals Inc	Cov 2-1
274	Professional Software	305
277	Professional Software	307
278	Program Store	239
280	Programmer's Institute	174
281	Programmer's Institute	357
282	Programmer's Institute	359
253	Prometheus Products Inc	149
285	Protecto	419
284	Protecto	203
289	Quinsept	210
369	Qume	208
245	Racet Computes Ltd	245
291	Radio Shack	197
292	Ranco Software Games	358
293	Reader's Digest	229
294	Red Baron	222-223
296	Redgate Publishing	215
297	Reston Publishing Co.	86
298	R.H. Electronics	217
299	R.H. Electronics	35
300	Rock-Roy, Inc.	218
301	Roland Corp US	324
302	Royal Softouch	372-373
303	Royal Software	52
305	Savvy	198
358	Scitor	349
307	Sculpture By Softouch	403
308	Sensible Software	351
309	S.G.C.	291
258	Sierra On-Line, Inc.	69-101
310	Silicon Valley	231
311	Sirius Software	38
312	Sirus Software	271
275	Sir-Tech	151
276	Sir-Tech	153
313	SJB Distributors	63
314	Small Systems Engineering	235
315	Smith Corona	78
316	Soft Images	157
317	Soft Images	159
318	Soft Images	161
319	Soft Images	163
320	Software City	385
321	Software City, Inc.	244
279	Software Dimensions	232
323	Software Galore	325
324	Softwareland, Inc.	240
325	Software Models	358
326	Software Publishers	371
327	Software Street	361
328	Software Tree	400
329	Southern California Research Group	230
330	Southwestern Data	248
331	Spinnaker Software	14-15
332	SRA	340
333	SRA	341
334	SRA	397
335	Standard & Poor	98
336	Star Micronics	80
337	Sterling Swift Pub. Co.	371
338	Stoneware, Inc.	84
339	Stoneware, Inc.	152
340	Strategic Simulations	139
341	Strategic Simulations	201
342	Strictly Software	301
295	Sublogic	43
343	Sublogic	212
344	Success Sellers	399
345	Suntronics Co., Inc.	174
346	SuperSoft	193
347	Symtec	403
348	Syntax Newsletter	299
349	Systems 4 Limited	285
350	Tech Data Corporation	365
350	Tech Data Corporation	365
351	Techcom Enterprises	333
352	Tecmar Inc	7
353	Texas Computer Systems	418
354	Texas Instruments	166
*	3 G Company, Inc.	356
355	Thunderware	171
368	Timex	44-45
356	Timex	165
304	TSK Electronics	221
357	Unicomm	253
306	Val Par	21
359	Van Horn Office Supply	349
194	Videx	36-37
361	Virtual Combinatics	62
362	Virtual Combinatics	64
363	VR Data	253
364	Wadsworth Electronic Pub. Co.	331
366	Yacaipa Software	333
367	Zor Khan Industries	366

*Write Advertiser Directly.

WHEN WE ANNOUNCED THE COMMODORE 64 FOR $595, OUR COMPETITORS SAID WE COULDN'T DO IT.

THAT'S BECAUSE THEY COULDN'T DO IT.



THE COMMODORE 64. ONLY $595.

The reason is that, unlike our competitors, we make our own IC chips. *Plus* all the parts of the computer they go into.

So Commodore can get more advanced computers to market sooner than anybody else. And we can get them there for a lot less money.

WHAT PRICE POWER?

For your $595,* the Commodore 64™ gives you a built-in user memory of 64K. This is hundreds of dollars less than computers of comparable power.

Lest you think that the Commodore 64 is some stripped-down loss leader, a look at its available peripherals and interfaces will quickly convince you otherwise.

SOFTWARE THAT WORKS HARD.

The supply of software for the Commodore 64 will be extensive. And with the optional plug-in Z80 microprocessor, the Commodore 64 can accommodate the enormous amount of software available in CP/M.®

Add in the number of programs available in BASIC and you'll find that there are virtually no applications, from word processing to spreadsheets, that the Commodore 64 can't handle with the greatest of ease.

PERIPHERALS WITH VISION.

The Commodore 64 interfaces with all the peripherals you could want for total personal computing: disk drives, printers and a telephone modem that's about $100, including a free hour's access to some of the more popular computer information services. Including Commodore's own Information Network for users.

RUN YOUR BUSINESS BY DAY. SAVE THE EARTH BY NIGHT.

At the end of a business day, the Commodore 64 can go into your briefcase and ride home with you for an evening's fun and games.

Because of its superior video quality (320x200 pixel resolution, 16 available colors and 3D Sprite graphics), the Commodore 64 surpasses the best of the video game machines on the market. Yet, because it's such a powerful computer, it allows you to invent game programs that a game machine will never be able to play; as well as enjoy Commodore's own video game cartridges.

ATTACK, DECAY, SUSTAIN, RELEASE.

If you're a musicologist, you already know what an ADSR (attack, decay, sustain, release) envelope is. If you're not, you can learn this and much more about music with the Commodore 64's music synthesizing features.

It's a full-scale compositional tool. Besides a programmable ADSR envelope generator, it has 3 voices (each with a 9-octave range) and 4 waveforms for truly sophisticated composition and playback—through your home audio system, if you wish. It has sound quality you'll find only on separate, music-only synthesizers. And graphics and storage ability you won't find on any separate synthesizer.

DON'T WAIT.

The predictable effect of advanced technology is that it produces less expensive, more capable products the longer you wait.

If you've been waiting for this to happen to personal computers, your wait is over.

See the Commodore 64 soon at your local Commodore Computer dealer and compare it with the best the competition has to offer.

You can bet that's what the competition will be doing.

Commodore Business Machines
Personal Systems Division
P.O. Box 500, Conshohocken, Pennsylvania 19428

Please send me more information on the Commodore 64.™

Name________________ Title________

Company______________________

Address______________________

City________________ State________

Zip________________ Phone________

commodore
COMPUTER

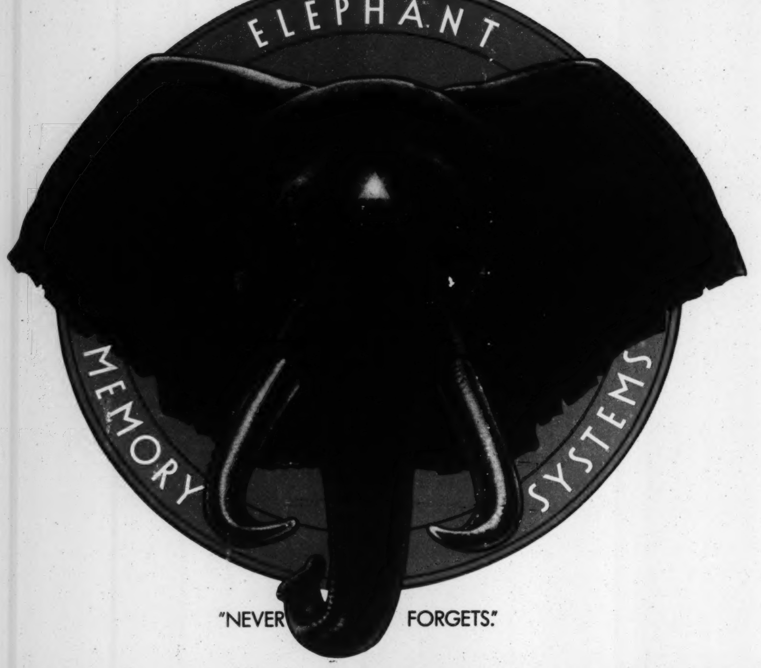
CC-12

**Manufacturer's Suggested Retail Price: July 1, 1982. Disk drives and printers are not included in prices. The 64's price may change without notice.*

CP/M® is a registered trademark of Digital Research, Inc.

CIRCLE 142 ON READER SERVICE CARD

REMEMBER:



MORE THAN JUST ANOTHER PRETTY FACE.

Says who? Says ANSI.

Specifically, subcommittee X3B8 of the American National Standards Institute (ANSI) says so. The fact is all Elephant™ floppies meet or exceed the specs required to meet or exceed all their standards.

But just who is "subcommittee X3B8" to issue such pronouncements?

They're a group of people representing a large, well-balanced cross section of disciplines—from academia, government agencies, and the computer industry. People from places like IBM, Hewlett-Packard, 3M, Lawrence Livermore Labs, The U.S. Department of Defense, Honeywell and The Association of Computer Programmers and Analysts. In short, it's a bunch of high-caliber nitpickers whose mission, it seems, in order to make better disks for consumers, is also to make life miserable for everyone in the disk-making business.

How? By gathering together periodically (often, one suspects, under the full moon) to concoct more and more rules to increase the quality of flexible disks. Their most recent rule book runs over 20 single-spaced pages—listing, and insisting upon—hundreds upon hundreds of standards a disk must meet in order to be blessed by ANSI. (And thereby be taken seriously by people who take disks seriously.)

In fact, if you'd like a copy of this formidable document, for free, just let us know and we'll send you one. Because once you know what it takes to make an Elephant for ANSI . . .

We think you'll want us to make some Elephants for you.

ELEPHANT.™ HEAVY DUTY DISKS.

For a free poster-size portrait of our powerful pachyderm, please write us.
Distributed Exclusively by Leading Edge Products, Inc., 225 Turnpike Street, Canton, Massachusetts 02021
Call: toll-free 1-800-343-6833; or in Massachusetts call collect (617) 828-8150. Telex 951-624.

CIRCLE 218 ON READER SERVICE CARD

C21